Railway Maintenance Engineer

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FIGHT
OR
BUY BONDS
THIRD
LIBERTY LOAN
Howard Chandler Christy 1917.

EDITORIALS

BACK UP OUR MEN IN THE TRENCHES

OVER 70,000 railway men have already rallied to the call of our country and entered the army or the navy. Large as this number is, it is increasing rapidly and will soon pass 100,000. The railway men who have remained at home are also carrying a heavy responsibility for the success of our arms, for the maintenance of the lines of communication between the munition factories and other sources of supplies and the seaboard is essential to the successful conduct of operations in France.

The part which the men at home are playing in this war is far from insignificant and its proper performance is just as vital to the successful termination of the conflict as that of the man patroling the trenches or the one building tracks under fire back of the lines. The difference lies in the conditions under which they are working. The man at the front has left position, family ties and the home comforts for the privation of the trench and dugout, while he realizes that he may be called upon to make the supreme sacrifice at any time. Already a considerable number of American railway men have given up their lives in the service and others are in hospitals in Frances or have been invalided back to this country, incapacitated for further service abroad. In contrast with this, the man at home suffers none of these privations. He is living in much the same manner as before the war began. The shortages of labor and of materials are making his problems somewhat more acute, but otherwise he is not affected to any appreciable extent. How then can he help to bear the burdens of his former associates—his representatives at the front?

The Government is offering a most direct means of co-operation and assistance through the Third Liberty Loan, which is now being inaugurated. Railway men in all branches of service rallied to the two previous loans in splendid fashion. As indicative of the manner in which they responded to this call, 122,456 employees of the Pennsylvania system subscribed for $9,051,700 for the second loan. Although many railway men made their subscriptions on their individual accounts with their local banks or Liberty Bond salesmen, a total of 241,280 railway employees subscribed for $20,027,966 through their roads.

The Government is now asking for an even larger amount than before and it falls upon those at home to subscribe the funds for the necessary materials of war and for the support of the men who have already gone to the front. The need is urgent. We must give—give until it hurts. Even then our sacrifice will not equal that of the men in the trenches who are risking all for liberty. This is the opportunity for railway men at home to let their associates across the water know that they are backing them up and that they are willing to continue to back them up to the limit until the war shall have been won.

PORTO RICANS AS TRACK LABORERS

A NEW ANGLE of an old problem is presented to the railroads by the practical assurance from Washington that thousands of Porto Ricans will be made available as laborers on the roads of the United States this summer. In the past the railways have secured their unskilled labor largely from the immigrants from Europe and from Mexico. Through contact with these laborers employers have learned the characteristics of the various nationalities represented and have capitalized this knowledge by providing, as near as practicable, facilities according to their customs to secure contented and efficient laborers. In the past this knowledge of national characteristics has been secured from studies and investigations made after the men had been employed. As a consequence periods of unsatisfactory results were experienced following the employment of each new race. In the case of the Porto Ricans the roads are now somewhat forewarned and have a limited opportunity to make some studies in advance of the arrival of the men. In these studies the conditions under which the men are accustomed to live should be investigated, as well as the manner in which they can be expected to withstand the rigors of our climate, the nature of the food most suitable and their other outstanding characteristics, etc. In this way we should be able to avoid many of the costly and unpleasant experiences of the past.

A TEST OF ABILITY

THESE ARE DAYS which are trying the mettle of men everywhere. We are living in the most strenuous time in history—a period in which vast changes are being wrought and new standards established and new measures are being raised. This transition is particularly evident in the railway industry. Its effects are to be observed in the maintenance of way department as elsewhere. The men in charge of the upkeep of the track and structures are confronted with more difficult problems this spring than ever before, yet they must overcome them in order that the lines of communication may be maintained.

The railways in most parts of the country are emerging from the most severe winter of many years. One storm of snow or sleet followed another during the winter until the tracks became little more than sheets of ice. Continued periods of excessive cold drove the frost deeper into the sub-grade than usual and led to much heaving of track. As a result the roadway has suffered more from weather conditions than normally. There has also been the wear and tear resulting from a traffic which exceeded all previous records. With such conditions following several years of inadequate maintenance it is evident that a larger amount of work and more than the usual care and supervision are necessary if the roads are to meet the demands which are to be made upon them.

It is this condition which will demand the best and most loyal service from every man in the maintenance of way department this year. The handicaps will be greater during 1918 than last. It was difficult and in many instances impossible to secure the desired quantities of rails and of other materials desired to keep up the properties last year. The indications are that it will be equally difficult to secure all of the supplies which may be desired this year. The indications are that labor will be even more difficult to obtain, and once secured, will be less efficient and more roving in its tendencies than in any recent year.

The responsibility on all men, from the chief engineer to the foremen, will be heavy. The exercise of resourcefulness and perseverance will do much to overcome the obstacles which are now confronting the maintenance of way department. The men in this branch of railway service can render no greater assistance to the country

than to give the best that is in them to the work in which they are engaged, for if the service on the railways should become demoralized because of improper maintenance the effect would be felt throughout our entire industrial life and even to the front line trenches. This is a man's war at home as well as abroad and it is the duty of every man in whatever position to measure up to the new standards which are being established.

SAVE A CAR

ONE OF THE MOST valuable reforms in railway operation brought about during the last two years has been the more complete utilization of equipment through loading cars more nearly to capacity and through the elimination of unnecessary delay in loading and unloading them. These improvements have been brought about largely through the co-operation of shippers in the handling of commercial freight. The maintenance of way department is also a large user of cars, shipping vast quantities of ties, rails and the other materials from one point to another. Until the last two or three years there has normally been a surplus of cars. There was not, therefore, the incentive to load them to capacity or to release them promptly and as a result it has been customary for maintenance men to load and unload them as best suited the convenience of the forces on the line and so as to result in the least delay on their part with little or no regard to the delays to the cars themselves.

Now that the amount of equipment is insufficient for the nation's business, delays to cars have assumed a new importance which some maintenance of way men have not yet appreciated fully. To direct attention to this subject and to demonstrate its importance under present conditions, we have therefore announced a contest on the "Conservation of Equipment by the Maintenance of Way Department," for which we solicit discussions of a practical nature, pointing out ways in which delays to equipment may be prevented or reduced by more systematic handling of work. In these contributions definite measures and results should be cited as far as possible. To stimulate interest, we offer prizes of $25 and $15 for the best and second best papers respectively and will pay our regular space rates for all others accepted and published. The prizes will be awarded to those papers which present the most valuable suggestions for the conservation of cars. Contributions to this contest should be sent to the editor of the Railway Maintenance Engineer, 608 South Dearborn Street, Chicago, and must be received on or before April 10 to be considered by the judges.

THE SPECIAL REPAIR JOB

SPECIAL work, like the tunnel lining repair project described elsewhere in this issue, occasionally falls to the lot of the maintenance man and its successful completion calls for the application of his best efforts. Work of this kind is frequently done by contract where because of its special character a railway may not be equipped with a plant or an organization to conduct the work with the necessary efficiency or to complete it within the desired time. However, before such work is started it is the maintenance officer who must devise a plan that is sufficiently complete to demonstrate its practicability.

Frequently the nature of the problem is such that it does not lend itself readily to contracting. More often than not the extent of the work cannot be predicted or the degree of difficulty may be so indefinite as to invite only the most extravagant bids. On the other hand, the work may be of such a nature as to make it most desirable to leave the actual amount to be done and the degree of refinement with which it is to be carried out entirely to the judgment of the man in charge. A common illustration of such work is the underpinning of a bridge pier that has shown signs of settlement. The difficulty of the work cannot be ascertained until much of the excavation has been made and the amount of old material to be removed and other details must necessarily be left to judgment based upon close inspection. Under such circumstances it is obviously better to do the work by company forces than to attempt a contract.

An unusual situation may or may not call for an unusual solution, but to discover the solution does not necessarily require inventive genius. In such cases the man with long experience has an advantage, but it is impossible for any one man to meet all possible conditions within the limits of his own tenure of service. If he is to make the most of his opportunities he must endeavor to learn what others have done under similar situations. He must be able to select the good from the bad and make the necessary modification to apply the idea intelligently to his own case.

THE STANDARDIZATION OF TRACK

NO PHASE OF Government control of American railways is subject to wider discussion or holds possibilities of more far-reaching effect than that of the standardization of railway equipment and materials. The principle activities along this line thus far brought to light have been directed toward car and locomotive design, and to date practically nothing has been said about the standardization of railway track. However, as it has been announced that rails will be bought by the central purchasing committee at Washington, which must necessarily decide upon rail sections and specifications, the subject is a live one to the man interested in maintenance of way matters. That standard rail sections will be adopted is probable, and there is little question but that these standards can be used without serious results if a sufficient number of weights are selected to meet the traffic conditions on various lines.

The danger in the application of standardization to track lies in the possibility of extending it to the other features of the track structure. The perfect track has not been produced. With a constant increase in train loads and axle concentrations the track structure is undergoing a process of evolution, under which improvements are constantly undertaken with a view to providing a roadway that is adequate for the service imposed upon it. The result is that there is no single feature of the track structure today that may be said to even approach perfection.

The problem of the rail joint is by no means solved. The relative merits of the cut and screw spikes are a subject of most active controversy today. Many devices of various kinds are being tried out on an experimental basis in railway tracks each year, and while it is true that a large part of them prove to be failures and most of the rest of them require further improvement, progress is being made. One really successful device may accomplish economies which will compensate many fold for the expense incurred in the experimental work carried on.

Another influence to be reckoned with is the work of the Special Committee on stresses in track. As the investigations of this body bear fruit in the form of definite recommendation, some changes in track construction will very probably be found desirable and it would be most unfortunate if such changes should be hampered by the establishment of inflexible standards.

LETTERS TO THE EDITOR

THE CONTINUING PROCESSION

Rock Island, Ill.

To the Editor:

The labor problem can only be solved by the foreman, the roadmaster and the company studying the question together. In the past the section foreman has educated the foreigner for the industries of this country. Ten years ago, industries would not think of employing a foreigner, but the railroad companies brought them here; the section foremen have educated them and for a few pennies a day the roads have then lost them after training them. The section foreman then gets another green gang, with which he starts over again.

There should be two rates for trackmen—a good rate to the man of experience or the man willing to learn, and a lower rate for the don't-care man or the inexperienced one, with the privilege of increasing it up to the first rate, if the men are willing to work to get it. I believe the married Mexican is the best man we have to-day. I have served the railroad for 18 years and have seen the Irish, the Italian and the Greek pass on, and now the Mexican will soon go. A. Davis,

Yard Foreman.

CHARACTERISTICS OF A SUCCESSFUL SECTION FOREMAN

Bellefontaine, Ohio.

To the Editor:

My ideal type of a section foreman is one who is kind to his men and a neighbor to all railroad men, as well as to all those who reside along the section. He can afford to be neighborly with the farmers and to assist them in any way consistent with the interests of the company, for he doesn't know how soon he may have to ask them for a favor. I remember an instance a few years ago, where a farmer who lived adjoining my section was hauling a heavy load which his team could not pull up the lane. I took my men and helped him. That same winter he helped me change out a rail when I was short-handed, having only two men. I sent my two men to flag and the farmer and I changed the rail. When I offered to pay him he reminded me of the favor I had done him.

A foreman should always consider the trainmen as neighbors, doing unto them as he wishes to be done by. He should never make a false statement about a derailment, but should always give facts. If they disregard his flags, he should tell the truth, and it will be better for all concerned. He should never write anything that he will be ashamed to read later. I always like to have the trainmen wave their hands or give me some token of recognition when they pass. If one is on the square with them they will do it.

A foreman's duties are numerous. He should learn to economize in both material and labor. Instruct the men to pick up all material, scrap or otherwise. Have a scrap box at the tool house and put scrap in it. Show me a careless foreman and I will show you scrap scattered from one end of the section to the other. Scrap accumulates very rapidly, but by constant effort one can keep it picked

Section laborers are scarce, especially good ones. One should, therefore, endeavor to keep the men in good cheer. He should not work them in the rain until they get wet and then go to shelter. If he goes to the dry before they get wet, they will think more of him and will feel more like working when the shower is over. The men should go to work promptly and quit on time. They should also do their work so it will not have to be gone over in a short time. I think each foreman should make it a practice to walk over his entire section once a week, watching closely for any defects, such as cracked splices, loose bolts, etc. B. E. Huston,

Yard Foreman, Cleveland, Cincinnati, Chicago & St. Louis.

OIL APPLICATION REDUCES BOLT RENEWALS

Moberly, Mo.

To the Editor:

At the present time when track materials are required for the prosecution of the war and the cost is excessive, it behooves every employee to make extra efforts to conserve materials. One method of saving material is to apply oil to frogs, switches, angle bars, rail and bolts, especially on track where brine is dropped from refrigerator cars.

In applying the oil to angle bars and bolts, we find that black oil is much superior to crude oil, as the former remains on the bars, while the latter evaporates or flows away upon the application of heat. The oil should be applied to the angle bars and bolts twice a year, that is, in the spring and fall. A week after the oil is applied, the bolts should be tightened with a wrench approximately 36 or 40 in. long, backing up the nut a turn or two to lubricate the threads. After the nut is tightened by this method, it will remain in position better than when oil is not applied.

By a test on this division (subject to brine dripping), we find that a saving of a keg of bolts per mile is made both in the spring and fall, on both 80-lb. and 90-lb. rail. The labor of applying the oil on angle bars and bolts will about equal the cost of installing new bolts, therefore the saving is in material. The cost per mile of black oil for angle bars and bolts (spring and fall) is $2.20. By comparison with the present cost of the two kegs of bolts to be saved by this operation, the cost of the oil is insignificant. W. W. Greenland,

Engineer Maintenance of Way, Wabash.

NEW BOOKS

Seasoning of Wood. By Joseph B. Wagner. 274 pages, illustrated, 6 in. by 9 in. Bound in cloth. Published by D. Van Nostrand Co., 25 Park Place, New York. Price $3.

While fully three-fifths of this book is devoted strictly to matter covered by the above title, the first two-fifths constitute introductory matter of a general nature concerning the subject of timber. Following two brief chapters on the general characteristics and properties of wood, some 70 pages are devoted to a cataloging of the various species, reciting the general characteristics in non-technical language. Wood borers also receives some attention in this book, but the treatment is limited to such as are encountered in air and do their damage either in the standing tree or in structures or devices made of wood. In the treatment of seasoning proper, attention is devoted to the relation of the properties of wood to its content of moisture, the influence of evaporation or manner of drying and a detailed discussion of the advantages of seasoning. "Kiln Drying" covers the principles of modern timber treatment in kilns, a comparison of the various types of kilns in use, illustrated with many photographs and two chapters devoted to the devices and methods used in the operation of kilns.

THE POSSIBILITIES OF A MAINTENANCE SHOP

Some of the Work Which Can Be Done With a Small Organization and Simple Equipment

BY C. O. HOOPER,
Roadmaster, Southern Pacific Lines, New Orleans, La.

IT CAN BE SAID SAFELY that of the several units comprising the operating organization of a railroad the track department is the most dependent, consequently its efficiency, when measured by the standards of the other departments, is considerably lower. New methods and appliances are being introduced constantly by the mechanical departments for the promotion of economy in the locomotive and car shops, and shop methods to-day are much changed as compared with ten years ago. Not so with the track department, and those who return to this branch of the service after a like period of absence will recognize, with but few exceptions, the tools and methods of earlier-day experience. Such tools as have been devised and placed on the market to reduce the labor requirements in the ordinary undertakings of the trackman are not adopted by the railroads as rapidly as the merits of the appliances would suggest. This, I think, is due to a general impression that the trackman is not familiar enough with the complicated mechanisms usually embodied in the designs of these labor-saving appliances, and therefore before it is practical to secure the extensive advantages claimed for such devices it is necessary that some method be adopted whereby appropriate training can be given that will enable the trackman to take advantage of these newer ideas. One practical method would be through apprentice assignment in the general shops of the employing company for those foremen and apprentice foremen who show a natural aptitude along these lines. This training will stimulate new ideas in the minds of the trackmen and will be reflected in their ability to create other mechanical devices that will further assist them in their field of endeavor.

WORK DONE IN A SMALL SHOP.

The writer, in the capacity of roadmaster, with jurisdiction over terminals of considerable size, has operated for several years a small blacksmith and repair shop devoted exclusively to the requirements of the track department, through which it has been possible to effect considerable economy over the usual methods of yard maintenance and repairs. The general character of the work undertaken in this shop is similar to that which is being done in most repair shops, in so far as light track material is involved, the difference being not in the method or manner of making repairs, but in the principle of the organization of the forces conducting this shop. When depending upon the general shops for such requirements, it is more often the case that the work will receive less preferred attention than if it were a job in connection with locomotives or equipment in which it is natural for the mechanical department to be interested more directly.

The organization of this shop is based upon the principle that the trackman can best serve his own needs in the ordinary problems which do not require highly trained mechanics and heavy machinery if provided with adequate facilities and if he receives a reasonable amount of encouragement from his superior officers. Aside from the economy derived from the use of motor-driven tools for the accomplishment of certain classes of work customarily performed by hand, it has been productive of practical devices which, without the liberty of shop facilities, would survive only as a mental picture.

In line with the principle above stated the blacksmith, who is in full charge of the shop, is himself subordinate to the yard foreman, who has been given sufficient training in the usage and requirements of the materials and tools of the department to acquaint him thoroughly with their relative importance. He has two helpers, drawn directly from the gangs on their merits and ability as trackmen with a slightly increased rate of pay over other laborers. To one of these helpers is assigned the special duties of maintaining the gas engine, which furnishes power to the several machines, operating the drill press and issuing and receiving all tools and supplies.

Tools furnished to the various gangs are drawn from this shop, and the worn and damaged ones must be returned that they may be repaired or discarded upon the judgment of the blacksmith, who takes into consideration the costs of the particular tool new and of restoring the old one to service and the extent of life added by repairing as compared with the pro rata value of the new one. As a matter of convenience to both the shop and outside forces, suitable racks are located on one side of the shop for storing and classifying all switch material, so constructed as to permit proper segregation and be easy of access.

Such repairs as are necessary for the upkeep of tools are carried on in this shop and the usual practice of having on hand the necessary duplicate parts for those most frequently worn and broken, in such items as jacks, drills, push and hand cars, switch stands, etc., is observed. However, the writer has departed from the usual form of construction in rebuilding both the push and lever cars by utilizing second-hand channel and angle irons in the frame and supporting members of the body and riveting throughout. The first cost is probably about the same as when constructed of wood, but the maintenance cost is very light when compared with the former.

Switch material released in repairs that can be restored to service is brought to the shop as soon as practical after its removal, the necessary repairs are made, and it is then stored in its proper place in the material rack, to be returned to the track when needed. Included in this class are the different rods used with various types of switches, damaged point rails and worn frogs. Tie rods for maintaining the gage in turnouts and sharp curves

are manufactured from truss rods or hog chains released by the car department in the dismantling of condemned equipment. The ½-in. by 4-in. flat bars forming the bottom tie between journal boxes on the light capacity simplex trucks are used for the same purpose, an ample supply having accumulated through the practice of condemning and destroying 30-ton equipment when more than a specified amount of repairs were required to make them serviceable.

Develop Special Devices

One of the accompanying illustrations shows a very simple and effective device used in bending wing rails of rigid frogs and the templet for determining the proper shape adopted in this shop. The idea is original with the blacksmith in charge and has proven very satisfactory in use. The bender consists of a switch tie for a foundation, to which is fastened a 4-in. strap made into the shape of a "U," with holes of sufficient size at the ends to receive a fulcrum pin. A short section of light rail, acting as an anvil, is fastened workways to the switch tie, with one end directly under the fulcrum pin. The rail to be bent is heated and placed over the anvil rail, with the bending point immediately under the pin, and is

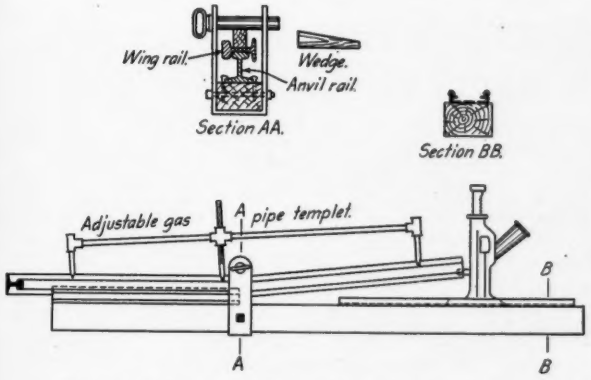


Fig. 1—Device to Bend Frog Wing Rails

wedged fairly tight. However, this wedge must come flush with the bending point, as it is over this wedge that the bending will take place when the track jack is applied. The templet shown in the illustration is made from sections of one-inch gas pipe and three fittings, two tees and one cross, the cross being in or near the center of the frame and receives the middle or adjustable arm, which is threaded to permit about eight inches' variation. By adjusting over the old wing it is possible to reproduce its exact angle when the templet is placed in the same relative position on the new wing. Where more elaborate facilities are not available this simplifies and makes practical timely repairs to wings. When done at the proper time the life of frogs can be extended to several times their running serviceability and proportional reduction made in the stock ordinarily carried on hand for renewal.

While I do not discredit any of the advantages or claims made for the patented guard-rail appliances, and advocate their use wherever possible, with the increasing prices of materials it is not always good policy to purchase these devices for yard and inside switches, particularly where the turnouts are laid with the lighter sections of rail and in the face of the general practice of increasing the weight of rail in switches as rapidly as the materials are available from main line relays. Guard rails in sharp turnouts are subject to considerable strain, require constant attention, and when not equipped with some form of gage-retaining device are apt to be more expensive than is commonly realized. The plain guard rail is usually of any old length and ofttimes the scrap value represented in the excess length will more than pay for suitable devices for maintaining the proper flangeway, if the present price of scrap material is considered.

Illustrations are given showing two designs to increase the safety and reduce the maintenance cost of guard rails of this class, where the patent attachments are not avail-

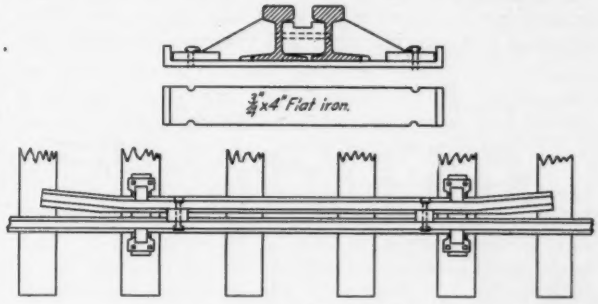


Fig. 2—A Double-Clamp Guard Rail

able, both types being produced by the maintenance shop without investment in special materials or the use of other than an ordinary forge.

Fig. 2 shows a double clamp guard rail in which the gage-retaining appliance consists of a flat iron plate of proper length, shaped exactly like many of the three-piece gage plates in common use to-day. Separators can either be sections of gas pipe or boiler tube cut to the desired length, or pieces of frog fillers, the latter being preferable. With over 300 guard rails secured in this manner, the maintenance has been very little. The breakage has been less than one per cent and in each instance the failure could be attributed to defective iron used in the plate.

In Fig. 3 is shown a second device that was designed after the supply of square-shouldered braces used in the

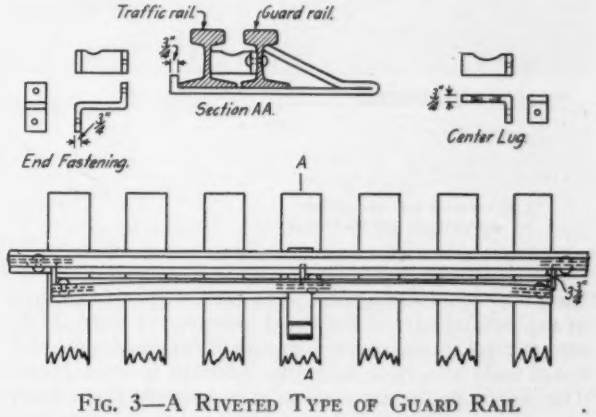


Fig. 3—A Riveted Type of Guard Rail

former attachment had been exhausted. The principle is the same as the various link appliances, but it requires no heavy forging, making it easy to manufacture. It is more desirable than the first, as it has fewer parts. As the separators are riveted to the guard rail this overcomes their working loose to a great extent. By riveting them to the traffic rail it is possible to eliminate bolts entirely. However, this is not usually convenient, and a ¾-in. by 2½-in. bolt is all that will be required at the ends when

made as shown in the drawing. The method of curving the guard rails is the same as described in connection with turnouts.

REDUCE FIELD OPERATIONS.

It is in the larger items of expense under the control of the trackman that the shop makes its greatest saving in labor, and as this problem is rapidly becoming more serious, with little hope for future improvement, I believe that any suggestions of a practical nature that will contribute towards overcoming this handicap will be received according to their practical merits. I would accordingly describe the practice I have employed in constructing and relaying leads and turnouts, the departure

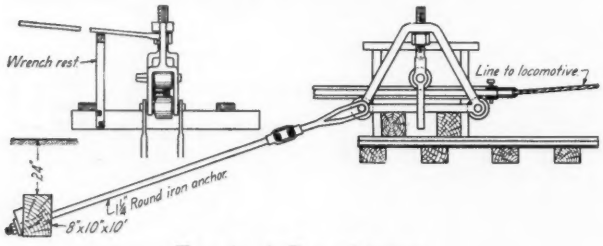


FIG. 4—A RAIL BENDER

from the usual methods having materially reduced the amount of labor entering into this class of work, as well as securing more uniform and desirable results. Any method that will permit the fabrication of a million-dollar steel bridge a thousand miles from the site of construction, with positive assurance that each member is of proper dimensions, before assembling, can also be applied to similar advantage in the construction of switches, and may be undertaken without any unduly expensive equipment.

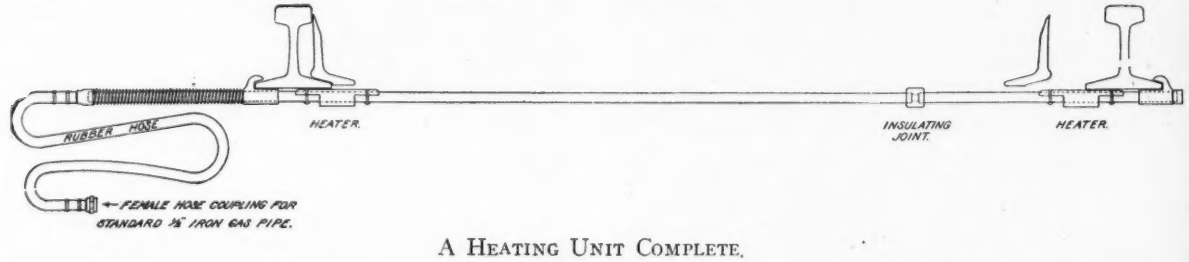
The practice as followed by the writer has been to cut and drill all rails at the shop by plans prepared previously for the purpose. For each different frog number a detail plan conforming to the requirements of the railroad standards has been drafted to show the various lengths of rails and the position of bolt holes for angle bars, filler blocks and guard rails, with due consideration to the cutting of rails to avoid unnecessary waste. By this method I am enabled to complete a turnout, with guard rails attached, with two laborers in four hours. The idea is not a new one, as it is frequently necessary to install a new switch in complete order at points subject to heavy traffic, so that train service may not be unduly interrupted, but as a general practice under ordinary operating conditions, this method is seldom employed. A competent draftsman familiar with switch design should be able to complete a working plan without difficulty, and if intelligently done he will have saved many times the drafting-room expense through the avoidance of short-cropping commonly referred to as rail butchery. This feature can always be taken care of at a time when most favorable and in advance of the working season, which will allow more time for other classes of track work, where labor is scarce and the season short. The mere advantage of having a definite plan to work by, based on accurate and reliable measurements, will always appeal to the trackman.

Adapted to this work, and for the pre-curving of rails entering into the construction of turnouts, a method of converting a very common type of rail bender is illustrated in Fig. 4. The bender is securely anchored in an upright position and the rail is drawn through the rollers by a locomotive or any other form of power which may be convenient. It might be presumed by those who have never curved rails by this or a similar method that a rail would straighten as it leaves the rollers, owing to the pull required in drawing it through, but no such trouble is experienced in actual practice and the rails curved in this manner are as perfect as when turned out by hand with the same tools, while the number of rails which it is possible to curve in one day by this system depends upon the speed with which they are handled to the rollers.

A NEW SNOW MELTER

THE RIGORS of the past winter have naturally turned the thoughts of not a few railway supply manufacturers to the perfection of devices for overcoming or at least ameliorating the snow troubles encountered on railways in winter months, and it is certain that the railway men who had to fight the snow and ice during January and February, 1918, are not hard to interest in appliances designed to reduce their winter troubles. One such device recently placed on the market is a switch heater, manufactured by the M. W. Supply Company, Philadelphia, Pa.

This development is based on the use of illuminating gas to supply the necessary heat. As seen in the drawing, the device consists of a piece of small diameter wrought pipe clamped to the underside of the stock rails with a heater or burner unit placed directly below the throw space of the switch rail. These heaters are sub-



A HEATING UNIT COMPLETE.

stantially bottomless boxes enclosing jet openings in the pipe on which they are carried, in such a way as to protect the flames from being extinguished by blasts of air or masses of snow. Each end of each heater is provided with a narrow slot near the top through which the flames are projected. One end of the pipe is connected by a piece of rubber hose to a ½-in. outlet on a line of gas pipe laid between the tracks from the gas main. It is said that two or three of these units will keep a 10-ft. switch clear during a severe blizzard, while additional units will be required for longer switches. Wind and draughts from passing trains do not extinguish the flames on the burner, so that little or no attention is required except to regulate the supply of gas required.

In localities where the season is usually severe, the

burners may be installed for use throughout the season, but it is also entirely practicable to consider the burners as portable equipment to be put in place only upon the approach of a storm. The heaters are readily placed by unskilled laborers in a few minutes' time. The drawing shows a spring on the intake end of the pipe which provides automatic adjustment for variation in the sizes of rails. There are no rights or lefts and all units are duplicates. The units are also applicable to slip switches, movable point frogs and an insulated joint is provided so that the equipment will not interfere in any way with track circuits.

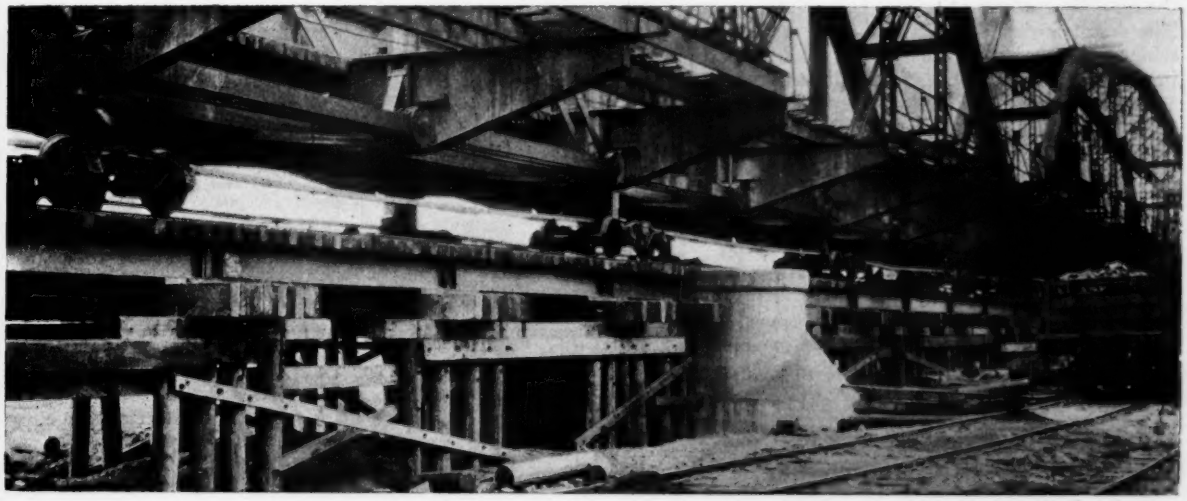
Moving Three Bridge Spans on Car Trucks

ON NOVEMBER 15 three through pin-connected truss spans 297½ ft. long weighing a total of 4,000 tons were moved longitudinally a distance of 136 ft. on freight car trucks in 13 min. These spans form part of a bridge of the St. Joseph & Grand Island over the Missouri River at St. Joseph, Mo. This change was made to provide room for a longer draw span required by the United States War Department.

The original bridge was built in 1872, the superstructure being renewed on the old piers and abutments in 1904. The new spans consisted from east to west of a plate girder approach span, a 357-ft. 8-in. draw span and three 297-ft. 6-in. fixed spans. While the new spans are entirely adequate to handle modern railway equipment, faults developed in the substructure which were found after careful investigation to require its entire renewal. It was decided to adhere to the present location of the bridge and make room for the longer draw span by shifting the three fixed spans longitudinally west by an amount equal to the difference in the lengths of the two draw spans plus the distance necessary to permit the construction of a new east rest pier just west of the old rest pier. This amounted to a total of 136 ft. 2⅝ in. and gave ample room for the construction of all of the new piers.

The plan for moving the three fixed spans was briefly to provide falsework for two standard-gage tracks, one directly under each of the trusses, these tracks to be used by freight car trucks on which to haul the spans simultaneously to their new positions. The tractive power was furnished by lines from hoisting engines placed back of the new west abutment. The character of the falsework is shown in one of the photographs. The bearing pedestals on the piers were removed so that the tracks for the moving trucks could pass over the tops of the piers. This required that the spans be jacked up to remove the bearing pedestals and the track placed continuous over the piers and falsework. After this work had been completed, the spans were again brought to bearing on the piers, using wooden blocking instead of the pedestals under the shoes.

Another requirement of the plan was that the spans remain in bearing on the piers for the passage of traffic until all preparations for moving were complete, when it was required that the weight of the structure be transferred quickly to the moving trucks for making the shift. This was accomplished by the use of 300-ton and 500-ton hydraulic jacks mounted on the trucks and operated in gangs from high power pumps installed on the bridge.



Spans on the Trucks Ready to Move

It was necessary to provide a pulling beam through which the tension on the pulling tackles was transmitted to the draft rigging. This consisted of two I-beams held together by batten plates and placed crosswise just ahead of the first two trucks, to which the tackle blocks were bolted or lashed. The pulling rig consisted of four sets of 2-in. rope tackles, each equipped with four-sheave blocks and snatch blocks to give a multiplication of 10 in passing the lines to the spools of the hoist equipment.

On the morning of November 15, after the passage of the last trains at 8:15, the first operation was the removal of the tracks and the tearing out of the temporary trestle between the old and new west abutments. This was accomplished largely by the use of locomotive cranes, one standing on the end of the west span and the other on the end of the approach embankment. The next step was to jack up the spans and remove the blocking under the shoes. All was ready for making the shift shortly before noon, and with the giving of a signal the

hauling started. The movement was continued without interruption until completed and the total time elapsed was only 13 min. As the movement was practically uniform throughout its duration this is equivalent to an average speed of 10½ ft. per min.

Following the successful transfer of the span to the new piers, work was started on the closing of the gap between the west end of the draw span and the east end of the east fixed span. This space was now occupied by the falsework on which the span had been moved, with the two hauling tracks about 10 ft. below the rail level of the bridge. To make up this difference in elevation pony bents previously framed were brought from the east approach by a locomotive crane and set into place. Stringers and ties for the deck, already framed for use, were lifted from a barge floating in the river alongside. This work was completed and the spans made ready to pass trains at 5:30 p. m.

The Gang Organization of 1918

BY ASSISTANT SUPERVISOR

THE TRACK WORK completed during the season recently closed has been handled under difficult and in many cases discouraging circumstances. Material deliveries have been irregular and uncertain, making it impossible to make plans that depended at all on their receipt. There has also been a shortage of track labor that has affected nearly all localities to a greater or less degree. In some places this shortage has been so acute that track gangs have almost ceased to exist and in many other places the track forces have been so reduced that the work has only been accomplished with great difficulty. The result is that there is an almost universal complaint which is expressed as poor labor conditions. The effect in different localities has been different only in degree and there is probably not a place where the expression, "Labor conditions," does not mean that there are not only not enough men available to do the required work, but that the men which are available are in general unsatisfactory. It is not the purpose here to discuss the reasons for this shortage, but to refer to some things that may be done to aid in completing the work that it will be necessary to do during the coming season with a small and inferior force.

The difficulties of the past season are now history, and the problems of next season are the important questions from now on. The work for 1918 must be outlined with the expectation that what we have come to call labor conditions will be worse next summer than during the season just past.

The labor difficulty throughout the past year has been both in numbers and in quality. The shortage in numbers might not in itself have been serious in so far as the mere upkeep of the track structure is concerned if men experienced in track work and particularly experienced in track gang work could have been retained in the service. The weak point has been the almost complete loss of gang organization. There are many different opinions as to the time required for a man to become an experienced track man. This term "experienced track man" is in itself very indefinite, but it is probable that any man anxious to work can become individually proficient in track work within a month at the most. The value of the man to the railroad company, however, will become greater for a much longer period of time as he becomes more proficient in gang work as compared with individual work. The question of the value of a man is not one of how many ties he can tamp in a day, but rather how many ties he can tamp in a day when working in a gang with other men. The work output that is important is that of the gang rather than that of the individual.

Some items of work done by trackmen can be called practically 100 per cent individual; there are others in which the importance of the individual is almost lost. An example of work that is practically 100 per cent individual is the mowing of a station lawn. The efficiency with which this particular item of work is accomplished depends on the man pushing the lawn mower and practically the only extent to which supervision and organization enter into it is to see that the lawn mower is kept moving. It is not meant here to intimate that in a number of men one will do this work as well as any of the others, but what is meant is that in this particular item of work, and also in the case of other work of the same general character, the efficiency of the performance is a function of the individual and not of the gang organization. At the other extreme is a large rail laying job which might be called 75 per cent organization and 25 per cent individual. In work of this kind, the efficiency is almost wholly a function of gang labor and the individual efficiency of any one of the men that make up the rail gang has but a limited effect on the final result. There is no real reason why we cannot mow lawns next summer almost as well and as efficiently as we did five years ago; however, there is every reason to expect that it will take 150 men next summer to accomplish the same amount of work in laying rail as 85 men accomplished five years ago. The detailed planning of next year's work so that every advantage is taken of the gang organization which remains and also so that the work is done in such a way that the necessity for gang organization is made as small as possible will be a factor of much weight in determining the degree to which next season's work will be successful.

Start with the problem of keeping the division cleaned up, which is work of the same general character as the mowing mentioned before. This work is not of primary importance, but it is of sufficient importance that some work of this kind must be done. Such work as this can be reduced to a minimum; too much stress need not be laid on the quality and for all practical purposes a green gang of poor men can do a satisfactory job. The time of men experienced in gang work on the track should not be wasted in general cleaning.

In the case of tie renewals, the questions of organization and supervision become important. The green gang of poor men that can be used for cleaning up would be a complete loss if worked as a tie gang. At the same time ties can be renewed by a well supervised gang of new men who are willing to do a day's work in a reasonably satisfactory manner. To help the tie renewal situation, the requirements should be reduced to a minimum by careful spotting. After the ties have been spotted, study and experienced judgment will be needed to determine the quickest method of work to accomplish the renewals. Each stretch of track should be considered in detail and such questions decided as the relative labor economy of raising a stretch of track for tie renewals, considering the labor necessary to raise the track, renew the ties in the raised track, surface it and fill it, in com-

parison with the time required to dig in the ties. No general rule that it is economical to raise stone ballasted track for tie renewals will do. What is required is the exercise of study and judgment to determine the method of work which will require the minimum of actual labor to accomplish the final result, and this study and judgment should be applied in the greatest possible detail.

There is also to be considered the maintenance of line and surface. The work of lining track is nearly all above ground and in plain sight. However, with a general inclination to let the other fellow do the pulling, it may be well to consider more carefully the economy of spending more time than has been customary in the past in digging out the tie ends to reduce the physical effort of lining track. In the case of surfacing track, there is also opportunity for detailed planning. In the first place, it will be well to avoid as far as possible all surfacing of track in face. The track may seem to need a general raise, but if it can be carried over by spot surfacing, it should be done. There is also an opportunity to supervise in detail the particular method of surfacing that may be followed by the foremen. A track foreman is usually rather conservative in what he considers the minimum time and extent that a tie should be tamped when he is surfacing track. In some cases the method of work followed can be modified slightly and satisfactory results accomplished in quicker time than has been the case before. One should avoid as far as possible allowing foremen to follow methods of doing work that require an extra week of work to make a good job that will only save a day's work later.

What has been said is not for the purpose of laying down any rules of work or even initmating the way any work should or should not be done. The idea is that next season's work is going to be done with a new kind of an organization. This organization will be weak as to individuals and weaker as to gangs. Plan the work so that this condition is realized and met and reduce the work that requires gang organization to a minimum. Also supervise in detail the method of work followed by the foremen. There will be a premium on any method that produces quick results. This does not mean harder work or inferior work; in many cases it only means to stop working at a place when through and move on to the next place. Also while any suggestion to work to a program under present labor conditions may seem to be out of the question, a program should be prepared and it should be based on what is judged to be the absolute minimum of work required. The problem then reduces itself to working to a known minimum and if even this minimum cannot be accomplished, the work to be left undone can be decided with complete and detailed information of what is involved in passing it up.

Three New Machines for Track Work

MACHINES TO PERFORM track work are of special value at the present time, in view of the scarcity of men and the high cost of labor. Three new machines which have been devised, perfected and placed in successful operation for the handling of rail, the drilling of rail, and the sawing of ties are therefore of particular interest.

The Rail Laying Machine

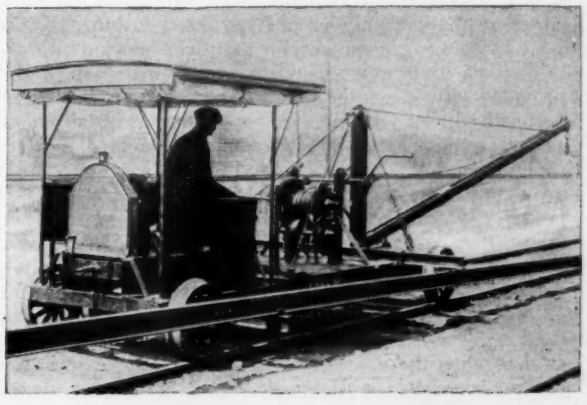
The function of this machine is to pick up rails, which have been distributed along the right-of-way, and place them in their desired positions. The number of men required to operate and perform the work expeditiously is four; an operator to handle the machine, two men to steady the ends of the rail which is being picked up, and one man at the center to apply the rail tongs. This machine has been found able to pick up 100-lb. rails up to 39 ft. in length and place them in position at a rate of 90 rails per hour, if necessary.

Power is furnished by a 4¼ in. by 5½-in. four-cylinder gasoline motor, so connected that the operator can move the machine in either direction, at speeds varying from 4 to 16 miles per hour. The low speed is used while laying rails, and the high speed is used only when going to and from work. All levers for operating the hoist and machine are conveniently located, and are manipulated from the operator's seat.

The weight of the machine complete is approximately 4,500 lbs. It is so constructed that four men can remove it from the track in less than six minutes, using a pair of specially-designed trucks or dollies, which are placed underneath the frame, allowing the machine to be run upon two crossing planks laid at right angles with the rails. Suitable trailer cars can be coupled to this machine, whereby a gang of 75 to 100 men can be conveyed to and from the work.

In addition to laying steel, the machine is used to haul and distribute extra rails, spikes, bolts, etc., when the steel gang is closing or finishing the track. This machine is also successfully used as a rail loader, in which case it is placed and anchored on a flat car, and the old rail is picked up and placed on another car ahead.

One of these machines was in operation recently near a station where the rail was distributed on either side of the track, and several switches, which were to be placed,



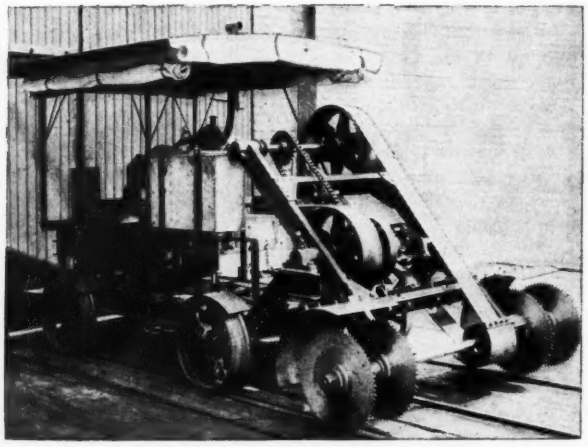
The Rail Laying Machine

were piled along a team track. Four men distributed the rails, frogs, and switches with this machine in two hours, while it is estimated that it would have taken 15 men 6 hours to do this work by hand. During a four-hour run on June 17, 1917, a gang of 58 men, using one of these rail-laying machines, laid 240 90-lb. rails in four hours, while full bolting and spiking the track. Ten days later, a gang of 48 men, using one of these machines, laid 157 100-lb. rails in 145 minutes, the machine being delayed several times waiting for adzers. During a part of this run, 60 rails were laid in 45 minutes. If these rails had

been laid by hand, 16 men would have been required on the tongs; while with a machine, only three men, in addition to the engineer, were required for the same work, effecting a saving of 12 men.

A TIE SAWING MACHINE

This machine is designed to saw or mark ties which require adzing. Circular saws mark the ties on each side of the rails, being set and gaged from the top of the rail to cut to a depth corresponding with the bottom of the rail. After this operation, the track is fully prepared for the steel gang, inasmuch as all obstructions,



THE MACHINE FOR SAWING TIES

such as rail braces, large boulders, etc., have previously been removed. Upon removing the old rail, the adzemen follow, clipping out the small blocks between the cuts and the depression left in the tie by the old rail. It is readily understood that by sawing the ties in this manner, very little intelligence and effort is required to do an accurate job of adzing, not only simplifying the task, but giving an even and uniform bearing for the tie plates.

The machine weighs approximately 2,800 lb. and is provided with a center pivot, permanently attached underneath the car frame. After raising one end of the car, a wooden block is placed under the pivot and the jack is removed, after which the machine is swung at right angles to the track and pushed upon two planks properly placed on the right-of-way. Two men can take the machine off the track in less than six minutes.

Power is furnished by a 4½ in. by 5½ in. four-cylinder gasoline motor, which propels the machine at from 3 to 18 miles per hour in either direction. The low speed is used while sawing ties and is connected synchronously, so that when the sawing is extra deep, the machine slows up in accordance with the speed of the engine.

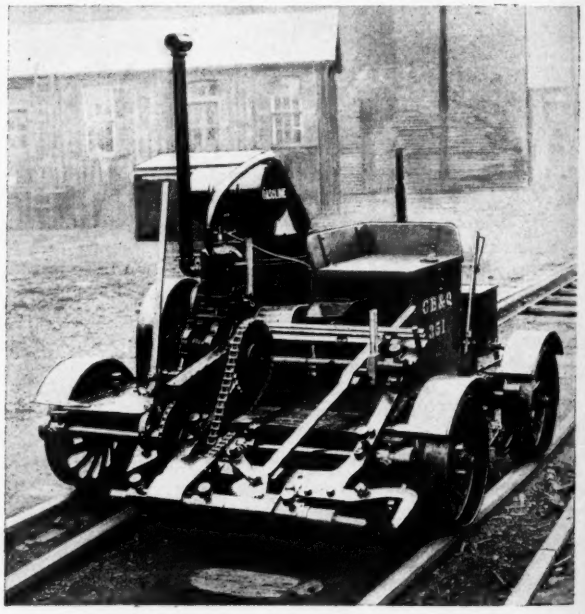
The number of men required to operate this machine successfully is two: an operator to handle the machine and look after the work in general, and an assistant to walk ahead, looking for obstructions such as rocks, rail braces, etc. Under normal conditions, from 3 to 5 miles of track are sawed per day, depending on the number of trains during the working hours.

THE RAIL DRILLING MACHINE

The function of this machine is to drill holes in the rails for rail anchors, connections, etc., superseding the hand power drilling machines. Power is furnished by a 4 hp., 4 in. by 4 in. single-cylinder, four-cycle, water-cooled, gasoline motor which propels the car at a speed of 18 miles per hour while going to and from work. The drill frame is so constructed that it can be swung in position and operated with one hand, drilling any size hole up to 1¼ in. The time required to move and set the machine, and to drill the hole is less than one minute.

Under normal and average conditions, it requires two men to operate this machine at its maximum efficiency: an operator to handle the machine and an assistant to mark the location of holes and to aid in removing the machine from the tracks, etc. On main line, the necessary flagmen will also be required for protection. In cases where the work warrants, two of these machines can be operated close together, using only one experienced operator and two assistants, and only two flagmen, thus obtaining the maximum efficiency at a minimum cost of labor.

The average number of holes drilled with one of these machines per day is 240, requiring three gallons of gasoline and two pints of lubricating oil. Drills are lubricated or cooled with pure water contained in a tank at the rear of machine and conveyed to the drills by pipe and flexible tubing. The weight of this machine complete is 1,140 lb. Two men can remove it from the track in less than 4 minutes. In addition to several other features, such as an automatic feed, etc., a drill grinder



THE RAIL DRILLING MACHINE

is mounted on the frame of this machine and the drills are ground while waiting for passing trains.

These three machines were designed and have been patented by W. T. Krausch, engineer of buildings, and E. F. Weber, assistant engineer, of the Chicago, Burlington & Quincy, Chicago.

JAPAN'S FUEL PROBLEM.—Anthracite coal in Tokio has been raised from 7 to 18 yen ($3.50 to $9) per ton. One of the causes attributed by coal dealers to the increased prices was the lack of space in the transportation of coal by the railways and shipowners, while at the coal mines and the provincial coal depots, stock is being accumulated to the annoyance of mine operators. The output of the collieries is increasing, but it is yet out of keeping with the demand of the market.

NEED MORE LABOR SAVING EQUIPMENT

Two Discussions of the Situation and Some Typical Examples of What Can Be Done

UP TO THE PRESENT, the application of labor-saving equipment to track work has been very limited. In fact, the development of equipment of this character is still in its infancy. The ratio of the work in the maintenance of way department which is now handled mechanically to that which can be performed with the aid of equipment is relatively small. The next few years will undoubtedly see a great development in equipment of this character.

In the papers which are published below two railway men present general discussions of the application of mechanical equipment to maintenance work and four others present accounts of specific uses of labor-saving devices.

GETTING OUT OF THE RUT

By James Sweeney,
Supervisor, Chicago & Eastern Illinois, Danville, Ill.

Any mention of labor-saving machinery for track work necessarily takes us back to that old gray-haired joke about the old-time section foreman who chased the newest section hand away from the hand car with the timely admonition to "Give me that ile can and get away from the car, what do you know about machinery?" I am firmly convinced that that old joke stood the test of the ages, and simply because it is founded on facts.

Just to refresh my mind regarding the character of the machines in actual use on an average section, I got out the list of tools allotted to a section, and the only items that I could in any way classify as machinery on that list were the hand car and the grindstone. With a force of men scattered over this entire country taught to think of labor-saving machines in terms of hand cars and grindstones, can one imagine that even under the stress of war an Edison of the track will spring forth with an idea that will revolutionize all of the drudgery piled up by years of accumulated track problems?

Aside from a few new devices, the section man has been put through his paces much as a horse working in a sorghum mill, going round and round and always in the same path. I will not make any exceptions from the chief engineer to the track laborer when I say that for years in maintenance work we have been dutifully imitating the old horse, and we have followed our little orbit throughout the season cycles until we could not tell whether our work was chasing us or we were chasing our work.

I don't mean to say that there have been no inventions by track men or that those which were made were not good. If I had my way, the man who invented the weed-killing device would have a place in the hall of fame. We all know how scarce men were this summer, but there are still roads on which the weeds are cut in the old-fashioned way. While we are thinking of the scarcity of labor, consider a section man cutting weeds with a scythe on the sunny slope of a fill, while a farmer is cutting hay with a mowing machine with an umbrella on it, in the adjoining field, and then wonder why the section hand leaves the road.

I hate to think of the fate of most of my old road-master friends who did turn inventors. To be sure, some of them succeeded, but most of them did not. I am not worrying about the ones who made good, but I do think of those who failed. Without money or backing, they took a half-formed idea from place to place, seeking aid to perfect and establish it. Without exception, there was a real demand for the article they were attempting to make, but they failed to meet the man who could make it perfect. Some of these unsuccessful ones gave up the struggle and went back to the track, but more often they continued to tinker and toil with the idea until it wore them out.

I do not know now where, in some obscure corner, there may be a man working on some device that may do for the track what the rail-laying machine has done, but I do know what he has ahead of him under the present system. First, he must protect his idea with a patent, which will take about all the ready money he will have. Then, in the full flush of achievement, he will go to the largest supply house he can find either to sell it outright or to contract it on a royalty basis. If he can do that his troubles will be over, but if he cannot, he must then fall back on his own resources, and we will find him trying to do business with a little shop that can neither add prestige to his device nor give him the benefit of the experience of an engineering force of experts along this line. Unless he has an invention that ranks well up with such devices as the tamping machine his chances of success are as one to a hundred, and as often as not the chances are against him simply because he does not know how or where to get a foothold.

There were two things wrong with every inventor of this class; one that he has become so imbued with his idea that he cannot see the faults of it himself, and the other that the very people whom he is trying to benefit have failed to provide a clearing house for just such ideas. In the latter I believe the greater weakness lies.

One automobile factory has long had in effect a system of gathering and threshing out the new ideas of its men, with a department to receive any suggestions, and to consider any idea along any line. If it is accepted the originator receives proper consideration, and if it is rejected it is returned to him with a full statement of the cause of its rejection. The best part of the whole scheme is that, no matter how worthless the idea is found to be, the man who offered it is made to know that his efforts are appreciated. If this company can sort through all the worthless suggestions for the possible one idea of value out of the thousands offered, what is to prevent those interested in railroad maintenance from forming a committee to pass on all suggestions? I do not believe it would be difficult to secure voluntary assistance from enough competent men to form a committee to act as such a clearing house. It is not possible to know the ideas for advancement that may be in the minds of the thousands of men on the 400,000 miles of tracks in this country, yet being one of them, I have faith that we would not all continue to circle round and round in the same old mill if we could but see some way to get out of it.

I might picture the roads getting in still worse shape because we are attempting to compete with a labor shortage and still believing that "pap's way" was best. I might point out men leaving our work because we continue the barbarous custom of unloading treated ties by hand instead of with a derrick, thereby poisoning the

men. I might indicate the loss of effort by still following "pap's way" and allowing 14 men out of an 80-man steel gang to pull spikes when the more sensible way would be to build a contrivance to pull them, or I might call attention to as many as 20 men of the same gang picking away at the old ties with adzes, getting them ready for the new rail, instead of working our brains on a machine to do it in a way that poor old "pap" never dreamed of. However, it should not be necessary to state that we did not have railroads such as those of the present day in "pap's" time, and "pap" never saw troubles anywhere near as bad as we are having right now.

THE FIELD FOR LABOR-SAVING DEVICES

By J. W. Powers,
Supervisor, New York Central, Rochester, N. Y.

While there have been improvements in the methods of doing track work which tend to reduce the cost of maintenance, it may truly be said that the greatest improvements have been in track tools and labor-saving devices and appliances. It is a well-known fact that a foreman who has a motor car can secure and retain better men and accomplish much better results than one with a hand car. In addition to carrying men to and from work, many of these cars are equipped to do work usually done by manual labor namely, drilling steel, boring wood, sawing rails and wood, putting in screw-spikes, putting on and taking off track bolts, riveting, grinding tools, mowing a swath on each side of track and to furnish power for tie-tamping machines. No satisfactory results on track with any kind of ballast can be obtained except by thorough tamping, intelligently performed, and supervisors who have occasion to study the results obtained from automatic tampers are unanimous in their opinion that they cannot be surpassed.

The use of a rail-laying machine eliminates the heaviest work connected with rail laying. It accomplishes equal results with a reduction of from seven to nine tongmen, the number of men saved depending on the weight of rail.

The employment of steam shovels and railroad ditchers, together with air dump-cars and spreaders, is now recognized as the most economical and efficient means for excavating and disposing of excavated material. In addition to the work referred to, railroad ditchers can be used for loading and unloading coal, cinders and riprap, and for handling snow or other material, all of which tends to reduce the cost of maintenance and conserve labor.

To remove gravel from the center of track, flangers have been installed on a road spreader similar to those used on snow flangers, with the exception that the blades extended outside the rail for a distance of two feet. These flangers removed the ballast from the entire center of track and to the end of the ties, except for a distance of 2½ in. on each side of the rail, where it was necessary to cut off the flange plates to prevent them from striking track bolts. The flangers are operated by a lever and controlled by one man and can be adjusted to cut any depth required below the top of the rail. Because rail-cut and crooked ties project above the base of the rail, it is not possible to remove all the ballast down to the base of the rail, as the flanger will strike the high ties, but at least 80 per cent of the gravel can be removed.

In addition to the flangers, two small wings conforming to the slope of the standard roadbed will distribute the material outside of the ends of the ties, the wings being placed at such an angle that they will remove the material from the high spots in the shoulder and deposit it in the low places. The cost of equipping a leveler with flangers and small wings is low. A car thus equipped and loaded down with scrap rails can be moved from 6 to 10 miles per hour. The use of this car for one day has effected a sufficient saving in labor to pay for installing the extra attachments, as well as the cost of a work train. It takes the place of many men. Use has also been made, with good results, of a rail-loading machine for picking up and unloading old ties which were removed from track in deep cuts and for loading and distributing new ties. These were handled by the use of chains which would hold from 10 to 15 ties. Besides eliminating much heavy work, the cost of handling this material was much lower than would have been the case with manual labor.

As a matter of safety and economy, it is essential that in climates where much snow has to be contended with, especially in sections of the country where snow blockades are of frequent occurrence and of a serious nature that the best snow equipment available should be procured and kept in perfect condition. The equipment required depends upon the severity of the storms encountered and with the use of modern equipment, but little hand labor is required.

In addition to standard single- and double-track wing elevator snow plows and flangers equipped with air, it is sometimes necessary to use rotary plows where the snow is very hard and deep. All cuts should be protected properly, either by portable or permanent snow fences or by widening the cuts, as it is very costly and tedious to release snow-bound trains. The snow equipment referred to, together with levelers, have been found both practical and economical for removing snow from both sidings and yards, as well as main track. A sweeper similar to those used by some street car companies has been found to give excellent results in removing snow from switches, especially through ladder tracks and paved streets. There are other devices which have their advocates, such as various snow-melting outfits, which may give satisfactory results where good drainage is provided.

In addition to the equipment already referred to, attention is called to the following, which are especially designed to save labor and reduce costs: Weed burners, tie tongs, switch-point straighteners, tie spacers, ballast screens, reversible rail benders and tool grinders. The latter have been found to be almost indispensable with a rail-laying gang.

It is the opinion of many that have given the conservation of material serious attention that the interest of safety and economy demands a more general use of manganese frogs at crossings and other points subject to heavy traffic. In most cases a manganese frog will outwear three or more common frogs. With the cost of both considered, the manganese proves a good investment.

A further saving in busy yards is made possible by the use of improved guard rails, guard-rail clamps, manganese point switches, automatic (quick repair) switch stands, all of which are designed to promote the utmost efficiency and economy in the maintenance of busy terminals and have demonstrated their usefulness by reducing derailments to a minimum, thereby avoiding delays to switching, which is a very important factor to be considered. However, there is almost no practice that has contributed more to reducing the cost of track maintenance than the judicious use of well-designed rail anchors.

RAIL UNLOADERS

By S. C. Tanner
Master Carpenter, Baltimore & Ohio, Baltimore, Md.

The question of labor-saving tools and devices in the maintenance of way department involves many problems and is a matter requiring the closest judgment. There are times when a saving of labor through a sacrifice of material will be profitable. At other times it is more desirable to conserve the material at almost any labor cost.

Rail Unloader Between Two Gondolas

Thus the labor-saving devices are so closely related to the conservation of material that to gain the best results from either one, both must be fully considered.

In labor-saving tools, the rail unloader no doubt takes the lead on the Baltimore & Ohio. There are many of them in use which were designed and constructed by the maintenance of way department and so arranged as to operate from the train line and load or unload at both ends of the machine at the same time. They will also operate over the tops of gondolas or flat cars. These rail unloaders are also used for other work, such as handling timber and stone which is not of a greater weight than 100-lb. rail. The accompanying photograph shows a rail unloader placed between two gondolas.

MELTING OUT LEAD PIPE JOINTS

By E. M. Grime
Supervisor, Northern Pacific, Dilworth, Minn.

During the past season it was found desirable to clean three miles of 10-in. water main between a pumping station and an important division terminal. The method of doing this work made it necessary to cut into the pipe line at intervals of about 600 ft. and install an overland by-pass through which water could be pumped without interruption while this section of the main pipe line was being cleaned. The cleaning was accomplished by means of flue cleaners varying in size from 7 to 10 in. and followed up by wire brushes, finally leaving the pipe line as clean as when first installed. These cleaners were moved through the pipe line by means of an endless cable and a windlass, assisted by water pressure from the main pipe line.

An important feature of this work was that of opening up the 10-in. pipe line, removing a section to allow for the cleaning process and again replacing the section. This required opening up 52 of the leaded joints. To save time and labor it was decided to make use of a small portable oxy-acetylene welding outfit to melt the lead from the joints. This outfit, consisting of an acetylene generator, a torch hose, etc., weighs 75 lb. and can easily be carried from one point to another. The oxygen drum used in connection with it weighs 130 lb., so two men easily handle the outfit. As the melting point of lead is 630 deg. F. and the temperature of the neutral oxy-acetylene flame 6,300 deg. F., the melting of the lead from a joint of 10-in. cast iron pipe takes but a few minutes, whereas it requires about four hours' labor to chip out the lead by hand. The average time for melting the lead from a joint was 12 min. and by placing a small pan underneath the pipe about 95 per cent of the lead was saved, whereas it would practically all be lost when chipped out by hand.

The cost of this part of the work figured out as follows:

3,200 lb. oxygen gas at 0.11 cents	$ 3.52
49 cakes carbide at 17.1 cents	8.38
Labor, 10 2-5 hours at 35 cents	3.64
Cost of welding outfit, $161.70, and depreciation at rate of 5 per cent per annum for four months amounted to	2.70
Total	$18.24
Cost per joint	$0.35

The saving for each opening in the pipe figures as follows:

Labor to cut lead by hand, per joint, $1.40, as compared to $0.35 above, saving	$1.05
Lead saved per joint, 13.8 lb., at $0.097	1.34
Total per joint	$2.39

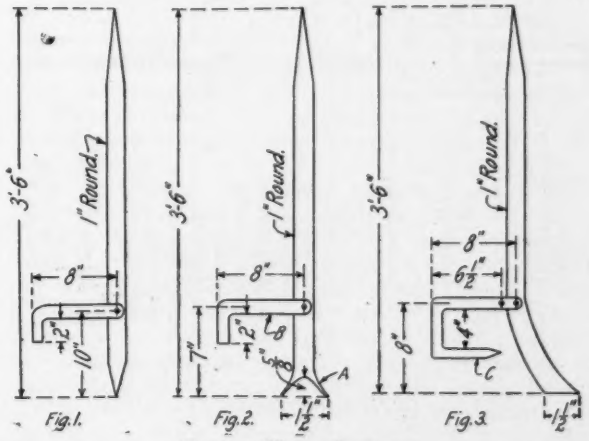
In addition to this saving, which amounted altogether to $124, time was saved by the entire crew and it was possible to finish the work during favorable weather at least two weeks sooner than would otherwise have been possible.

Many other uses can be found in the water service department for one of these small welding outfits, such as welding cracked water pipes, standpipe parts, etc., saving not only labor but frequently much inconvenience by reason of equipment made ready for service in a very short time as compared with the delays incident to ordering new parts.

SPECIAL HAND TOOLS

By E. J. Laughlin,
Supervisor, Carnegie Steel Company, Clairton, Pa.

The sketches show three handy track tools, of which I have had several sets made, and find most useful and efficient for all section and extra gangs when renewing



Three Hook Levers

rail. The tools are applicable on practically all weights of rail. The device shown in Fig. 1 is used for pulling and holding a rail to gage, especially when laying new

tracks or when both lines of spikes have been pulled, as when removing a heavier section of rail, or when applying tie-plates.

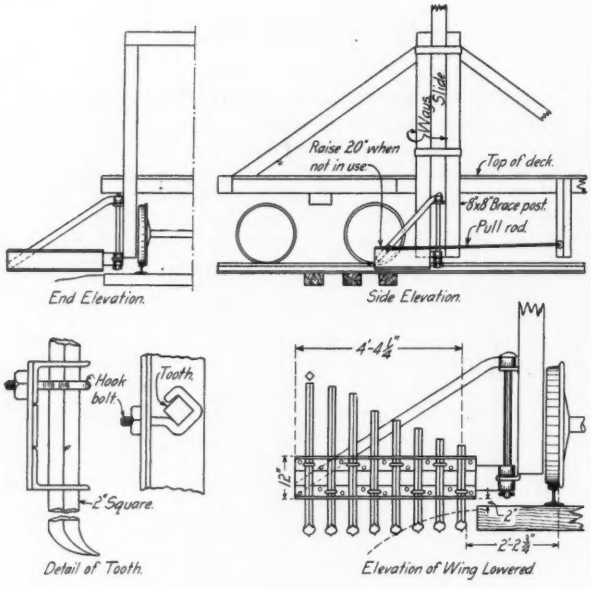
Fig. 2 shows a device for use on rail renewals and is especially useful on bridges and trestles, where it adds greatly to the safety as well as the efficiency of the service rendered. Point A is semi-circular in shape to grasp the back and head of a spike or clip bolt, as the case may be, and B is an L-shaped hook falling over and clasping the ball of the rail to pull it to proper position for spiking and gaging. In Fig. 3 is shown a device used for applying angle bars. One man uses it on all angle bars to apply one or two bolts loosely, as circumstances determine, he being followed immediately by men who apply and full-bolt all joints. Point C passes through the rail and both angle bars and by pulling or leaning against the upright bar, the angle bars can be held securely and bolts applied by *one man,* thus reducing the cost of applying them approximately 50 per cent. The L-shaped or hook device on all three appliances are simply applied to the outside or contact bar and both hook and bar have flat sides at the point of contact, thus rendering all parts most simple, easily repaired and of ready use by the most inexperienced track laborer.

NEW USES FOR A SPREADER

By A. M. CLOUGH,

Supervisor, New York Central, Batavia, N. Y.

The drawing shows an attachment to a roadbed spreader which has saved thousands of dollars in the last two seasons. It is a weeder attached to the movable post of the spreader. When operated it is swung out at right angles to the car, or nearly so, and lowered to any depth required. When the car is run at from six to eight miles per hour the attachment effectively cleans the stone ballast between or outside the tracks, loosens



DETAILS OF THE SPREADER ATTACHMENT

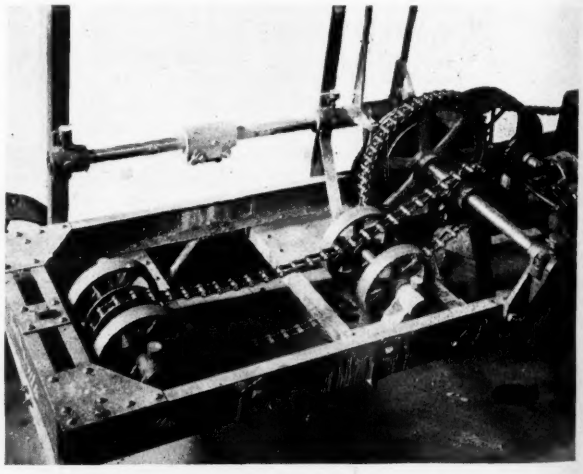
it up and causes the dirt to go to the bottom and does the work of a large number of men. Where grain or weeds grow between the tracks a heavy chain dragged in a semi-circular form behind the weeder smooths the stone ballast down, leaving it clean. This chain is attached to the inner and outer ends of the device. It is quickly lifted by air over any obstruction and can be regulated at any angle to fit tracks spaced 12 or 13 ft. center to center. The teeth are made in graduated lengths to fit the contour of the ballast dressing on the outside shoulder, where it can be used as effectively as on the level surface between tracks.

Another valuable attachment is a plow to remove stone or other ballast from between the rails down to the tops of the ties. This, too, is a labor and money saver, and can be run with perfect safety. It is practically a flanger, but it is built strong enough to remove stone ballast and is operated either by hand or air. Being attached to a spreader car, it adds to the efficiency and uses of this class of equipment.

This car also has a set of grading wings that will remove material to the full depth of and from the ends of the ties to permit a track to be thrown on a fill, a set of wings for filling that level material away from track without interfering with the standard shoulder, and a set of wings for removing ice and snow from track water pans. All of these are 16 ft. long and are used at an angle such that they will remove material 14 ft. from the rail of the track the spreader is running on.

A NEW DEVELOPMENT IN CONCRETE MIXER DESIGN

THE ACCOMPANYING photograph shows the frame and running gear of a new concrete mixer and illustrates a recent development in mixer construction. Mixer drums operated by a chain drive com-



DETAILS OF THE SUPPORTING FRAME

monly have the chain pass around the drum. In this mixer the chain goes under the truck frame around an idler pulley on the roller shaft and back under the drum. The drum acts as an automatic tightener, and the upward pull of the chain insures a contact between the chain and the sprocket teeth. This same lifting tendency reduces the wear on the roller shaft and boxes and is also said to minimize the wear on the chain and sprocket ring.

This departure is embodied in the new No. 7 Smith-Chicago mixer manufactured by the T. L. Smith Company, Milwaukee, Wis. The mixer has a drum capacity of seven cubic feet of mixed materials and is equipped with a horizontal gasoline engine mounted in a weather-proof house at one end of the frame. It is built with

either an elevating loader or a loading platform. Another feature of the equipment is a discharge chute which automatically locks in position when set for discharging. Consequently the concrete falling on the inside end of the chute cannot tip it back into the inoperative position.

Repairing Tunnel Linings With Gunite

THE LININGS OF TWO TUNNELS on the Northern Pacific which had become seriously disintegrated through the combined action of water, locomotive gases and frost, were repaired recently by giving them a coating of "gunite," a cement mortar, applied by means of the cement gun. Owing to the fact that the entire replacement of these linings would have been both expensive and dangerous, the success of the plan adopted, which necessitated the application of only a relatively thin coating over the old lining, is of special interest. Because of dense traffic and bad atmospheric conditions in one of the tunnels, the work was done under rather trying circumstances.

The tunnels in question are the Bozeman tunnel, located about half-way between Livingston, Mont., and Bozeman, and the Mullan tunnel, about 20 miles west of Helena, Mont., the former at the summit of the Gallatin range and the latter at the summit of the Continental divide. The former presened the most serious difficulties and is treated in greater detail in the following description:

The Bozeman tunnel is 3,650 ft. long, built for single track, and was lined some 20 years ago with brick and concrete. About six years ago the approaches from both the east and the west were reconstructed to reduce the grade to 1.8 per cent compensated, these grades extending into the tunnel at both ends to a summit located about 900 ft. from the west portal. Double track was extended up the hill to the portals at the same time.

Both approach grades are operated with helper engines, and as the maximum grade extends into the tunnel, the pushers must follow the trains through in each direction, dropping back after the train passes the summit. This operating arrangement, coupled with the location of the summit within the portals, results in the continual presence of dense smoke. The tunnel is very wet, enough water flowing out of the east portal to supply a water station at Muir, located a sufficient distance down the grade to permit a gravity flow into the roadside tank. This water, coming through the lining and subject to the action of the flue gases and the frost in winter, resulted in the disintegration of both the brick work and the concrete, the latter suffering the worst. At one time 200 weep holes were installed at various points in the tunnel to concentrate the flow and reduce the seepage through the lining, but this did not reduce the progress of disintegration materially.

Similar conditions obtained at the Mullan tunnel, which is 3,900 ft. long and is lined with a brick arch and concrete side walls. The disintegration in this tunnel, however, was not so severe. The summit of the grade line is outside the tunnel, and because of this and the fact that a ventilating plant is in operation, the atmospheric conditions within the tunnel are much better.

After a study of the situation at both of these points a contract was awarded to the Cement Gun Construction Company, Chicago, to repair the linings with an application of gunite. The contractor was paid on a quantity basis, determined by place measurements, the engineer in charge determining the extent and thickness of the coating to be applied from an inspection of the condition of the lining and observation of the results secured as the coating of gunite was applied. This coating was put on to a thickness of 1½ to 5 in. No attempt was made to fill the deeper holes, some of which had a total depth of over one foot. Wherever the lining appeared to be in good condition the coating was omitted. Usually in cases where portions of the first course of brick had disappeared no repair work was done wherever investigations showed that the course underneath was in good condition.

The contractor furnished the plant, labor and superintendent. The railway supplied the materials and the work-train service. The plant consisted of a box car containing a gas engine, belt-connected to a 10-in. by 12-in. single-cylinder air compressor, which supplied air to a cement gun machine placed in an adjacent car, which also contained the materials for making the cement mortar. The roofs of these cars were used as platforms on which the men worked while cleaning the surface of the lining, attaching the reinforcement or applying the stream of gunite. The mixture in the cement gun was transmitted to the nozzle through a 1¼-in. hose. The nozzle was of 1-in. caliber and was also attached to a ¾-in. hose supplying water for washing. It was necessary to operate the air compressor at a rate that compressed about 125 to 130 cu. ft. of free air per minute, in order to maintain the necessary pressure of 30 lb. pr sq. in. at the nozzle.

The crew for operating the plant for one shift consisted of one engineer for the compressor, one man operating the cement gun, two or three men mixing the materials, one man feeding the gun, one nozzle operator and one nozzle helper. The materials consisted of cement and sand, the latter secured from Logan, Mont., and being required to pass a ⅜-in. screen. The sand and cement were mixed in the proportions of 1 to 3½, or 9 sacks of cement to 30 cu. ft. of sand. The cement used in the Bozeman tunnel totaled 3,700 sacks and that in the Mullan tunnel 3,400 sacks. The mixture of the material remaining in place in the coating is of course much richer than that indicated above because of the rebound of a large portion of the pebbles. This rebound was greater on the brick surface than on the concrete. One sack of cement on an average covered an area of 2¾ to 3 sq. yd. to a thickness of 1 in.

Before applying the mortar ½-in. lag screws 4 in. long were set in holes drilled with pneumatic hammers, and No. 28 American Steel & Wire Company triangular mesh was attached to these screws in strips of sufficient length to cover as great a width of the arch as it was desired to coat. In general the gunite was applied to a thickness that was deemed sufficient to stop the leakage. Where large areas were wet it was found possible to apply the material around the edges first, gradually reducing the area until finally the water was closed off. In some cases the installing of additional drain pipes resulted in unwatering portions of the lining so that no protection was required. In a few places near the bottoms of the side walls concrete was applied by hand where it could be done readily rather than to shoot it in place with the gun. In some cases two layers of

gunite were applied, but on the whole one coating was found sufficient. In the Mullan tunnel several large holes in the arch were repaired by building form work into the holes against which the gunite was applied, the forms remaining permanently in place. As the new surface was adequately reinforced the eventual decay of the form work was of no concern.

The work on the Mullan tunnel was done first and required five months' time. When this was completed the plant and crew were moved to the Bozeman tunnel. Here the work was hampered both by the density of traffic and by the continual presence of smoke. Counting the pusher movements, there were as many as 65 train movements through the tunnel in 24 hours. The work train operated under a No. 19 order and was always under the protection of the staff system in effect between the stations at each portal of the tunnel. Both night and day shifts were employed, but the total number of hours of actual work in the tunnel in each 24 was relatively small because of the short periods that the work train could remain in the tunnel and the long waits between times. Atmospheric conditions were always bad, not only because of the slow escape of the smoke produced by the moving trains, but also because of the presence of the locomotive attached to the work train. The workmen suffered severe discomforts both because of difficulty in breathing and the fact that, with the presence of both water and smoke, they quickly become covered with a black slime. Furthermore, the smoke made it very difficult to illuminate the work, and it was necessary to rely upon bells almost entirely for transmitting signals between the men.

While the work on the Bozeman tunnel was in progress the compressor car caught fire and before this could be extinguished the machinery had been ruined. For the remaining work the air was supplied from a temporary plant rigged up from another compressor operated by a steam engine receiving steam from the work train locomotive. Because of the combination of adverse conditions obtaining, the work was very trying for the entire force and progress at times was extremely slow. The work in the Mullan tunnel was completed on September 19, 1916, and that in the Bozeman tunnel on November 24. The repair of both of the tunnels was under the direction of A. M. Burt, chief engineer maintenance of way of the Northern Pacific, and F. J. Taylor, division engineer at Livingston, Mont. A. F. Eckhardt was the superintendent for the contractor.

A Discussion of Labor Appropriations*

BY J. T. BOWSER,
Maintenance of Way Department, Southern Railway, Danville, Ky.

THE SYSTEM OF MONTHLY appropriations for expenditures for labor and material to be used in the maintenance of way and structures, is employed in various forms on nearly all railroads in the country. However, the duties required of foremen and supervisors in connection with this appropriation vary from a simple assignment of the average number of men to be employed on each gang, to a more complicated accounting for each hour of labor expended, and a rigid adherence to a scientifically determined number of men allowed for each section of track.

The purpose of appropriations for labor and material expenditures is to limit the amount of money expended for each class of work, on each section or extra gang, to a figure consistent with: (1) The financial condition of the road, (2) the season of the year, (3) the density of the traffic, (4) the character of the construction and of the country through which the road runs. Since all these conditions cannot be known to the supervisors, or even at times to the division officers, the number of men to be employed and the amount of material to be used, cannot be left entirely to them.

For a basis from which to determine the amount to be allowed, division officers are usually required to make recommendations of the amounts to be allowed. In some cases, the amount of detail embodied in these recommendations goes so far as to show the number of men recommended for each gang, and an explanation is required of any variations from previous recommendations or allowances. If, in the opinion of the management, the recommendations of the division officers are consistent with the financial condition of the road, the density of traffic, etc., the amount is usually appropriated as a whole, and the distribution is left to the division officers or the supervisors, who are more familiar with local conditions, and can make a distribution based on the character and amount of the work to be done on each section, or the amount of money or the number of men to be allowed to each bridge, building, or extra gang.

So much for the reasons for the appropriations for maintenance. Now to apply this appropriation to the foremen and to explain how things should be done, and why they should be done in a particular manner.

"LABOR MAY BE PLENTIFUL AT OTHER POINTS"

The roadmaster or division engineer receives the allowance for his division in one or more totals. It is then up to him to distribute it so that it may be used to the best advantage, though in some cases he is held more or less strictly to the distribution shown on his recommendations. On some railroads it is the practice to give

*Previous articles in this series on Maintenance of Way Accounting have appeared in the December issue, page 381, the January issue, page 18, and the March issue, page 105.

a money allowance only to each road supervisor or supervisor of track, or a certain number of men to be distributed by them; and a money allowance as a total to the supervisor of bridges and buildings, leaving to him the distribution. In other instances a detailed allowance showing the actual amount to be expended by each gang is given and sometimes even the number of men to be employed at each rate on each gang is specified.

In either case the allowance finally reaches the foreman in the form of a total sum of money, or a certain number of men, neither of which may be exceeded except by special instructions. This distribution is based on the

"Good Men Value Regular Employment"

actual number of working days in the month, and any men who are required to work on Sundays or holidays are shown separately. Therefore, the number given represents the number of full working-day months..

On some divisions, after the allowance is given, nothing more is required of the foremen than to see that they do not exceed the amounts specified, various penalties falling on the man who works more than his allowance provides. In this manner, although the foreman may be held down to his allowance, in many cases the men may not be available to fill out the gangs in one locality, while labor may be plentiful at other points on the same division, and if every gang is held strictly to the number of men allowed, the total amount of the allowance is not used. In times when the allowance is small, the division officers naturally desire to get the full use of every cent appropriated, and they therefore require daily reports of the foremen, which are often a part of the daily time report, showing a distribution of the labor expended. From this, calculations may be made as to the amount expended on the allowance at any time during the month. The division officer can then shift the men allowed at points where full forces cannot be obtained, to sections where extra men are available, and thus take advantage of the entire amount appropriated. These reports also enable the division officer or the supervisor to prevent the careless or ignorant foreman from overrunning his allowance, and involving the division office in censure from the management. Track and bridge supervisors also often require of the foremen daily or weekly reports showing the amounts expended on the allowance for the same reasons.

The final figure showing the expenditures on the allowances are made from the distribution in the monthly time book, as it is on this distribution that the maintenance of way accounts are based, and the final report of the amounts expended on the allowance must agree exactly with the accounts. It is therefore quite important that the information shown on the daily reports agree with that reported on the time book, so that these final reports may coincide with the figures on which the supervisors or division officers have based their increases or decreases in forces.

In any case, it is very important that the foremen keep within their allowances, unless they are instructed to increase forces on account of labor shortage at some other point, or for other reasons. A few days over the allowance on one section would make no appreciable difference, but if each foreman exceeded his allowance by a few days on a whole district or division, the result would be an excess of hundreds of dollars, which cannot be explained easily.

Another effect of foremen exceeding their allowances is the reduction of forces which becomes necessary when the supervisor or roadmaster discovers from the foremen's reports that the allowance is being exceeded, and orders a general cut in order that he may bring the expenditures for his division within the amount appropriated. This seriously disorganizes forces and causes the loss of valuable men, for good men value regular employment and resent being laid off for several days each month. This force-cutting also works a hardship on the foremen who are entirely innocent of any wrongdoing, but if the excess over the allowance once gets a start, the innocent must cut with the guilty if the district or division allowance is not to be exceeded.

Labor expended on special appropriations for new work and similar jobs is not, of course, included in the allowance for maintenance, and there is quite a temptation for a foreman to work an extra man or two on maintenance and charge the time to any special work which may be going on on his section, thus covering the excess. This practice is not only a violation of the rules of the railroad, but is also contrary to the laws of the United States, which provide severe penalties for the wilful falsification of accounts.

The maintenance appropriation is a sort of a governor on the labor machine in the maintenance of way department. It is adjusted monthly with reference to the conditions affecting operation, and slows down or speeds up the working parts to meet the varying conditions governing operation and maintenance. It is adjusted by men whose business it is to know finance as well as maintenance of way problems, and it is not for the local maintenance officers, important cogs in the machine though they may be, to interfere with the adjustment, as their knowledge is specialized and one-sided.

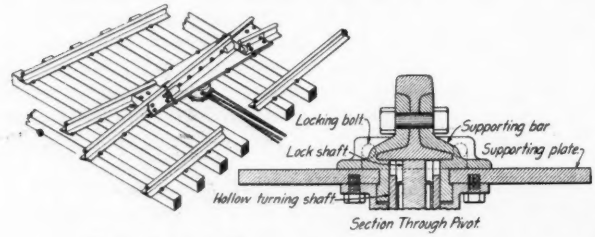
A FROGLESS TURNOUT

A DEVICE has recently been placed on the market to replace the frog in a turnout and afford continuous rails for both tracks, thus eliminating the wear and tear on tracks and equipment consequent to the passage of wheels over the flangeways of the usual frog. Particular interest is attached to this device because it has been actual service under heavy traffic for over four years.

The appliance consists essentially of a short length of rail mounted on a pivot so located with respect to the theoretical point of frog that a rail can be swung into line with the running rails of either track. The movement is accomplished by a system of rods and levers actuated from a switch stand or interlocking plant. A suitable locking device is provided to secure the rail absolutely in line for one track or the other, the arrangement being such that the switch stand lever cannot be

locked unless the locking bolts of the swing rail have been fully driven home. When connected with an interlocking plant it conforms to the usual locking requirements.

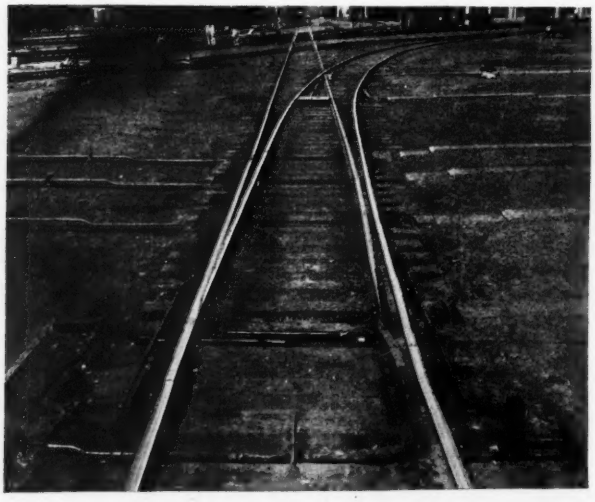
All parts of this device exposed to the traffic are mounted on a steel plate, which is spiked to the ties. The four rail ends are fastened to this plate by means of spreader blocks and cast steel angle bars bolted to



THE SWING RAIL AND APPURTENANCES

both the plate and the rails so that there is no opportunity for the rails to run under the effect of traffic and temperature. In consequence, there is no opportunity for the stock rails to jam the swing rail, a common source of trouble with the old stub switches. The swing rail is supported for its entire length by two cast steel bars, having the general shape of two base-supporting rail-joint bars except that each of them is provided with bosses at the ends to house the bolts which lock the rail in position by passing into holes in similar bosses in the cast steel angle bars supporting the running rails.

In the earlier designs, illustrated in the photographs, the swing rail was moved by rods attached near its ends, and was locked by means of rods driven end-wise between the stock rails. In an improved design, the working mechanism is contained in a cast iron drum located

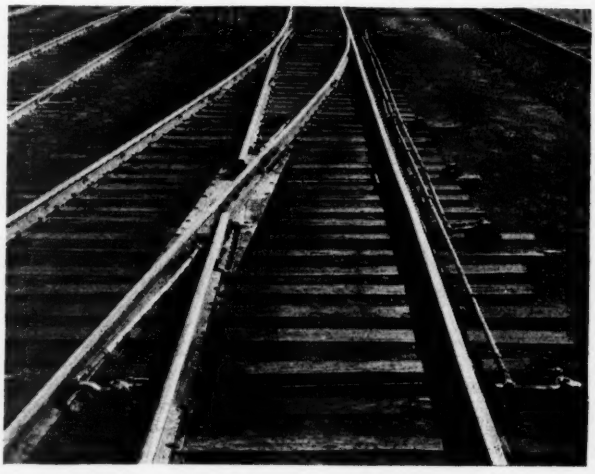


A FROGLESS SWITCH IN SERVICE AT TOPEKA

directly under the pivot, and the operating rods entering this drum are below the surface of the ties. The operating mechanism consists of two concentric shafts, one to swing the rail and the other to lock and unlock it. The outer or swinging shaft is attached to the two cast steel supporting bars which carry the swing rail, while the inner or locking shaft has two small levers at the top, each of which is attached to rods extending to the ends of the swing rail to actuate the lock bolts. These two rods are located underneath the base of the swing rail in the space between the edges of the supporting bars.

Four rods are provided to operate the swing and lock mechanism. This is done so that the operation is carried on entirely with a pulling movement on the rods, two rods being provided to swing the rail and two to lock and unlock it. When operated electrically, the operating mechanism is placed in a box of timber or concrete sunk in the ground outside of the track opposite the point of frog. Otherwise the rods are carried to the switch stand or interlocking tower.

A special switch stand has been developed to operate the switch point and swing the rail frog simultaneously by one lever. To turn the switch the lever is raised to a horizontal position, this motion unlocking the swing rail. It is then swung in a horizontal plane for 90 deg.,



INSTALLATION IN SERVICE FOR FOUR YEARS

thereby turning the target and throwing both the switch and the swing rail at the frog point; lowering the lever to lock it also locks the swing rail in position.

One of the photographs shows one of these frogless switches in service in the eastbound freight track of the Atchison, Topeka & Santa Fe, at Argentine (Kansas City), Kan. This installation is operated from a switch stand and has been in service for over four years. The other photograph shows an installation on a wye track subjected to heavy traffic on the Santa Fe at Topeka, Kan., which has been in service for two years. In this case the switch and frog are operated from a tower.

A number of advantages are pointed out as being of importance in connection with the service records of this device. The anchoring of the stock rails to a plate having the same coefficient of expansion as the swing rails makes it possible to reduce the clearance between the abutting ends of the swing and stock rails to a very small amount. In consequence, wheels pass over this joint with but little more jar than that occcurring at the common rail joint. The device requires much less metal than the usual frog and eliminates the necessity for guard rails. There are no parts above the level of the ties between the rails of either track. All parts of the device subjected to wear from traffic can be renewed readily and in a short time. This is particularly the case with the swing rail, which is nothing more than a section of rail of a definite length with a few bolt holes spaced to fit those in the two supporting bars. The device is manufactured by the Walls Frogless Switch & Manufacturing Company, Kansas City, Mo.

THE MAINTENANCE OF WAY ORGANIZATION

Two Pertinent Discussions of the Personnel and Problems of This Important Department

AT A MEETING of the Pacific Railway Club on October 11, two papers were presented on The Maintenance of Way Department—Its Organization and Problems. While of particular application to conditions on the Southern Pacific, these papers emphasized certain phases of maintenance of way work which are of general interest. They are therefore abstracted below.

MAINTENANCE ORGANIZATION

By H. B. Titcomb,

Division Superintendent, Southern Pacific, Stockton, Cal.

"A good track is commonly an indication of a solvent company, a wise manager, a skillful staff, and careful and trustworthy employees." Results cannot be obtained without expenditures or without an effective organization. One division, while apparently built on the same lines and given equal money and equal facilities, will accomplish results far in excess of another. The thought that is uppermost in my mind in the problem of maintenance is, therefore, organization.

Generally the public knows that there is a section gang, a section foreman and a roadmaster. They do not stop to realize the Southern Pacific has 10,133 miles of tracks, and that we require an average of over 10,500 section men and 3,500 bridge and building men. Section men are divided into 800 regular section gangs, and 111 extra gangs, each having a foreman. These gangs are again grouped under 10 division engineers on 10 divisions. We also have 258 bridge and building foremen and approximately 50 signal foremen, or a total of 1219 foremen out of a total of 14,000 men, every eleventh man being in a responsible position.

Sections vary in length, and necessarily so, based upon traffic, standard of track, locality and climatic conditions. Careful study will determine for each locality the proper and economical length of section. Under no condition should a main line section exceed 10 miles, but the branch sections may vary from 10 to 40 miles.

I do not share the general feeling that the service is going to the dogs on account of lack of competent foremen. There are lots of good men available if we will do our part in working earnestly with the recruit, instead of condemning him prematurely. The position of section foreman is an honorable one, it is steady and under proper direction becomes a position requiring honesty, integrity and skill. A foreman's wage, including house, fuel, ice, and water, equals about $4.25 per day; add to this the hospital privilege, pension system, continuity of service, permanency of his job, passes for himself and family, combined with possibility of advancement, and we have a wage that compares well with any other service. Further than this, the foreman works every day and earns considerable overtime, whereas in 90 per cent of outside positions there is always slack work. We could just as well say that our foreman should get $8 per day because a bricklayer can make that amount, but we all know that a bricklayer spends more than 50 per cent of his time looking for work or in changing jobs; therefore, in reality he gets less than $4 a day. Loyal men are not discharged on account of age, but they are moved to branch line positions where the work is less, and are allowed to do the best they can until the pension system protects them in their failing years. Men with children are moved to points where schools are available, and in many other ways are helped to make life more than mere existence. The same principle applies to the laborer in the gang.

At the present time there is an alarming shortage of labor in every branch of the labor field. As a matter of comparison, to show the trend of labor as it affects our road, I wish to present the following figures, which represent the track labor and labor and mechanics in bridge and building gangs on the Pacific system of the Southern Pacific company; this does not include foremen:

	1916	1917
January	10,016	11,010
February	10,470	11,131
March	10,178	11,104
April	10,391	10,461
May	9,931	8,664
June	10,808	7,750
July	10,709	7,054
August	10,635	6,932
September	10,796	6,986

Yet during this period the average pay to our section men has been increased 19.6 per cent, and of our bridge and building laborers and men 10 per cent, with practically the same relative percentage to the foremen.

Further, I would call your attention to the following tabulation showing the decrease in September, 1917, as compared with September, 1916—this by Divisions in order to show that the defection is general, and not applying to any one particular locality:

	September			
	1916	1917	Increase	Decrease
Western	1,125	652		473
Sacramento	1,458	662		796
Salt Lake	900	683		217
Shasta	369	241		128
Portland	1,410	1,084		326
Coast	1,099	824		275
Stockton	558	338		220
San Joaquin	1,244	586		658
Los Angeles	1,335	941		394
Tucson	1,298	975		323
System	10,796	6,986		
Decrease				3,810

This shortage of labor has the effect of stopping all improvement work, the laying of heavier rails, new ballasting, additional sidetracks, new terminals, etc. We are short 4000 men, and for a rough figure we could say that their wages, including the material that they would utilize, would easily average $4 per day per man; this means a loss of $16,000 a day that should now be going into the track, in the neighborhood of $400,000 per month, or, for a period of twelve months nearly $5,000,000. Possibly this would not extend over the full period, but we can easily say that there is nearly $3,000,000 worth of deferred maintenance. All realize that this condition cannot prevail indefinitely.

I challenge the statement that is commonly made by those either prejudiced or not competent to speak on the subject that there is ample labor in this country, providing we pay for it. It is true, however, that should the railroads double their wages they will get men, but, it will be at the expense of the farmer, the shipbuilder, or some other industry that is absolutely dependent upon

labor. In other words, we would be simply "robbing Peter to pay Paul." The railroad companies do pay fair wages, and wages commensurate with the average paid by farmers and others when we consider the matter from an unbiased view; our men have a definite wage every workday in the year; they are well housed and conditions are improving daily in the general sanitation and comfort of the general railroad laborers. We furnish them with ice during the hot season; we furnish them with coal, and we extend to these laborers the full benefits of our hospital association and the pension system. These items that I have mentioned are worth fully 30 per cent over and above the wage on the outside.

Another perquisite to our laborer is that we take him from the center of labor supply and move him over to the various parts of the State to the point where he is requested to work, and we return him back to this point of employment in case we discharge him or have no further work for him. This practically makes us a distributing transportation company for the industries at large. The farmer, the contractor and others are quick to note the benefits that accrue to the railroad laborer and they must pay a higher rate of wages to get them, generally about 50 cents more than the railroad, and in extreme cases as high as $1 more than the railroads. However, when they get through with the laborer, after two or three months, he is turned loose and must find some means of getting back to the city or get some other job, generally riding the "rods" back to the nearest city. All these points are deserving of careful consideration, and they are cited simply to show that, although the companies have greatly increased the wage, by this very increase they have forced the farmer, the contractor and others to greatly increase their wage.

In France the coolies are brought in by the thousands, especially during these war times, to do the laborer's work that is left by the men who are fighting at the front. What is true there is true here. We must face this situation squarely, without bias, and let down the bars to an effective labor, at least during the war period. The first and known market, of course, is the Mexican; he can be made a respectable citizen if given a square deal and the proper environment makes a good laborer. Some complaint has been made that the railroads discriminate in the wage of this race, but this is not true. We take these peons, after they arrive in the United States, impoverished and poorly clothed, and put them on the sections in Arizona and New Mexico, where they get good food, good water and a home; as soon as they become strong they move automatically to Southern California, part of them going with contractors or farmers, or with our gangs in that territory. Following this they move to the northern and central part of the State, where this differential as between the Mexican and others disappears, and if they are strong and capable they are given the same wages and treatment as the others. It is, therefore, very essential, especially during this war time, to let the bar down for the Mexicans, bringing them into this country to do the work that is necessary.

The second in line we may get is the Porto Rican. Probably this will help to some extent, especially on the Eastern coast, but we view with some alarm the question whether this would be a lasting benefit or whether we can get them in sufficient numbers to keep our railroads up in the condition that they must be to keep the troops and other supplies moving.

I view with some alarm the growing tendency on the part of officers other than the roadmaster, to outline work direct with the section foreman. It is ill advised and poor policy to criticize section foremen in front of the roadmaster and it is equally a show of incompetence for a roadmaster to shift the blame for general run down conditions of his track onto the section foreman. On any large roadmaster's district of say 20 foremen, fully 15 of them are competent, trustworthy and experienced. It then behooves the roadmaster to work with the weaker men, bringing them up to standard. The roadmaster must study the conditions of his territory, know what is needed and direct the foreman what to do and when to do it, and not sit back letting foremen do their best (or maybe their worst) and then blame all defects to the man who tried.

Too often a poor roadmaster is tolerated too long a time, causing great waste of money and, above all, valuable time, as work must be done well and thoroughly at the proper season of the year. He should organize the extra gangs, work with them and plan their work well in advance. Materials must be watched carefully and orders placed sufficiently in advance to allow for economical deliveries. Above all, he should treat his men like human beings at all times.

What has been said of the roadmaster equally applies to the division engineer. It is not a mark of competency to lay the blame on an incompetent roadmaster. The division engineer is in authority, he is responsible and he must change roadmasters when occasion demands. Do not wait until the track is in such shape that conditions can be seen through the "plate glass window." A competent engineer will realize the growing defects in his track and take steps to correct them before they become manifest to the manager on his trips of inspection..

THE MAINTENANCE OF STRUCTURES

By G. W. REAR,
General Bridge Inspector, Southern Pacific.

The structures that are of particular interest from a maintenance standpoint are those used for train operation; namely, bridges, culverts, cattle guards, tunnels, snow-sheds, and wharves. There are numerous other structures, such as water tanks, turn tables, roundhouses, shops, fuel plants, freight sheds, stations, etc., but, with possibly one or two exceptions, lack of maintenance will not affect the safety of train movements.

The railroad that has no tunnels is fortunate, but in mountainous country they are unavoidable. Practically all tunnels require some kind of a lining to support the loose rocks and earth and nearly all of the western tunnels, except those built in recent years, are lined with timber. Concrete is the proper lining for tunnels, and for several years the Southern Pacific has been engaged in replacing timber linings with concrete. The work is necessarily slow and expensive, and when it is considered that to line all our tunnels with concrete will require an expenditure of over twenty million dollars, some idea of the size of the job will be obtained.

Few railroads have snow-sheds, although most northern roads are put to great expense in removing snow. The Sierra Nevada range in California has the greatest known annual snowfall, averaging, in the vicinity of the Southern Pacific line, 35 ft. of loose snow per annum and with a record of 65 ft. twice in 10 years. With such a great snowfall, sheds are needed, and our annual expense to maintain the sheds is in the neighborhood of $100,000.

On the Pacific system of the Southern Pacific lines, there are 600 bridges over large streams, of which 28 are drawbridges, 136 miles of trestle and 23,000 culverts. Even such a dry country as Arizona and New Mexico averages 100 ft. of waterway per mile of road. Al-

together, this makes 33,000 openings through the track. This, with 29 miles of tunnels and 30 miles of snow-sheds, will give an idea of what the maintenance of structures means on a large railroad.

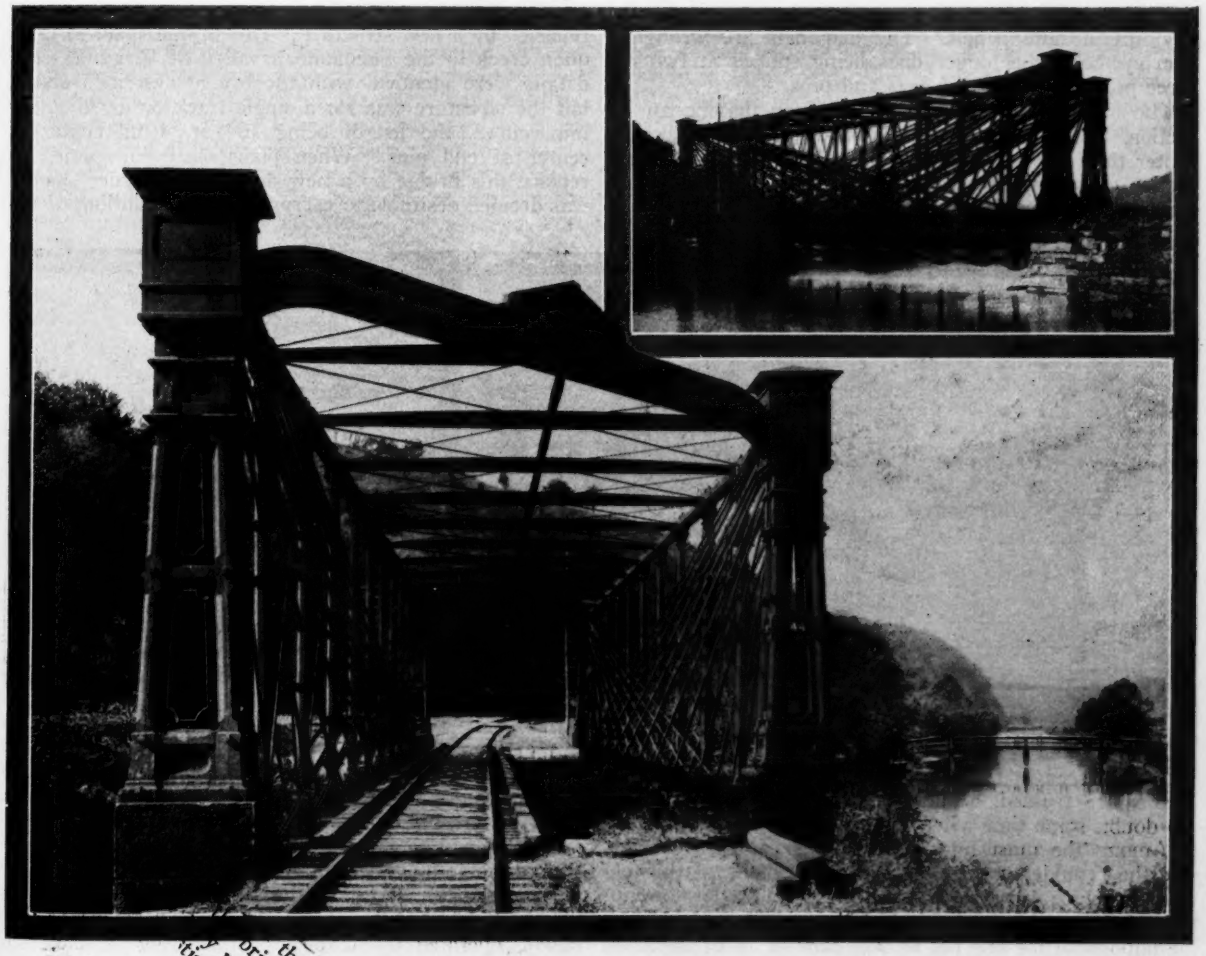
Probably the first requisite for the proper maintenance of structures is good standard plans, and we might add the fewer the better. With the great number of structures on the Southern Pacific lines, the number of styles is limited to about a dozen and employees are so familiar with them that hundreds of our men could make a bill of material for one of them with his eyes shut. We do not exactly buy our bridges by the yard, but we do buy them by the pound and 95 per cent of them are duplicates of others. To illustrate, this year we ordered 21 bridges, all of which were from standard plans made in 1902 and which were just as easily ordered as a ton of coal.

It must not be inferred that the great number of structures mentioned are maintained without labor, but a railroad as large as the Southern Pacific has 3500 maintenance mechanics, divided into about 200 gangs, each performing its own share of the work.

I am not going to try to give you an idea of the amount of material required, but as an idea of the immensity of things I will state that in one of the recent years we used upward of twenty-five million feet of lumber. This is about as much lumber as it has taken to build all the army cantonments.

An Example of Early Truss Bridge

THE BALTIMORE & OHIO is one of the oldest railways in the United States, and in consequence presents more features of historic interest than roads of more recent origin. Although progress in transportation has rendered obsolete practically all features that made up the original railways, circumstances have occasionally permitted some individual structure to withstand the vicissitudes of time and progress for many years. Thus the two accompanying photographs show views of an old bridge at Harpers Ferry, W. Va., which, after 65 years, is still in use in its original location in the first line of the Baltimore & Ohio at that historic place. The main line has been relocated for many years, but the original line and bridge are still used as a spur track to a pulp mill. Since the photographs shown here were taken the tracks have been moved to the center of the



THE BOLLMAN TRUSS SPAN AT HARPER'S FERRY

the bridge.
bridge on flat
means of this
engine, sta-
After th

bridge to distribute the loading uniformly to the two trusses.

The superstructure is of the Bollman suspension truss type, patented by Wendell Bollman of Baltimore. According to Theodore Cooper's "American Railroad bridges," this structure was built in 1852. The design is unique, although somewhat similar to the Fink truss, patented by Albert Fink, who was at one time an assistant of Bollman. The arrangement of the diagonals is such that the load from each floor beam is carried directly to the top of each end post by a separate set of diagonals. In consequence the bottom chord plays no part in the scheme, cast-iron struts being provided between the floor beams to serve simply as stiffeners. This web arrangement has been of particular interest in connection with the maintenance of the bridge, since any one of the diagonals can be moved without affecting any other portion of the bridge, even if taken out of the structure entirely.

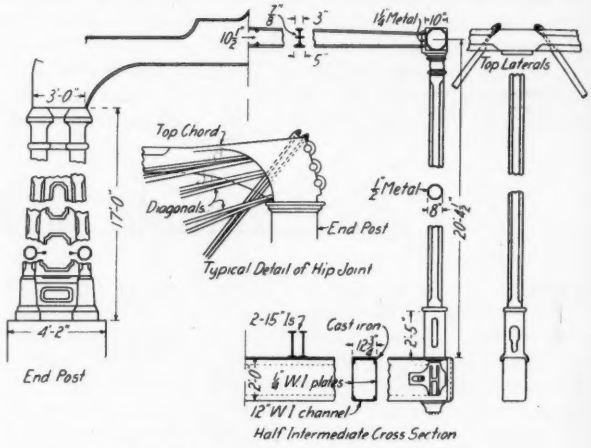
COMPRESSION MEMBERS ARE CAST IRON

The top chords and the posts are of cast-iron with hollow octagonal sections, the ends of each member being enlarged to a square section to facilitate the formation of a joint with the other members. The end posts are of ornate design, consisting of four octagonal posts connected by cast-iron paneling and bolts. These posts are battered to give a spread to the base, a feature of particular importance in this design, since it affords practically the only resistance to transverse swaying of the bridge. There is no bracing in the portals or in any intermediate panels. The diagonals are wrought-iron eye-bars, the longer ones being spliced at two or three points by means of eyes and pins.

The top chord struts are of cast-iron, having an I-section, bellied so as to be considerably deeper at the center than at the ends. The floor beams are of a box section consisting of a cast-iron top plate, two wrought-iron side plates and a wrought iron channel for the bottom. As seen in the side view of the bridge, the floor beams are trussed, a measure of strengthening taken, no doubt, some time after the bridge was built.

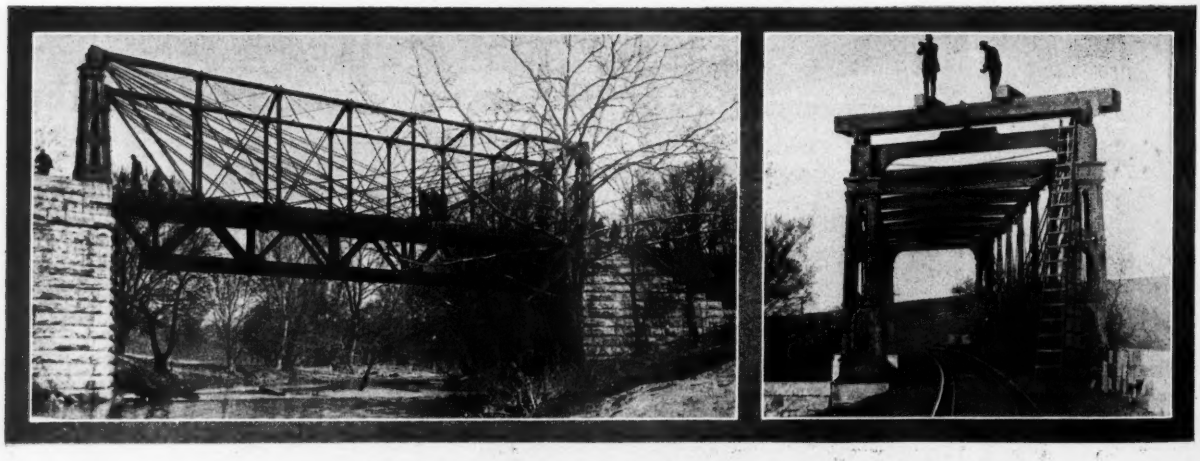
Among the most interesting details of the structure are the shoulders or skew backs at the ends of the top chords, which serve as the anchorage for the large number of diagonals terminating at these points. It would be impossible for one pin to take care of all of them, so a set of three pins was provided, these pins resting in grooves, one above the other in the end faces of these chords. This entire detail is enclosed in a cast-iron box surmounting each of the end posts. While this bridge has been in service for 65 years, it is still in good condition and will probably remain in service for many years to come if the present loading is not increased.

Another bridge of this type on the Baltimore & Ohio, erected in 1875 by the Bollman Bridge Company and



DETAILS OF A BOLLMAN TRUSS SPAN

one of the last of its kind to be built, was recently replaced by a new structure. This bridge spanned Opequon creek in the Shenandoah valley of Virginia. The details were identical with the bridge described above, but the structure was for a single track on a 7-deg. 30-min. curve. the length being 104 ft. 4 in. center to center of end pins. When plans were formulated to replace this bridge by a new deck lattice girder span it was deemed desirable to carry out the dismantling of the old structure and the erection of the new one without going to the expense of falsework. Accordingly heavy timbers were placed on the top chords directly over the end posts and to these were fastened four sets of five-sheave tackle blocks, one for each corne
The new spans were hauled out on
cars and then lifted clear of t
tackle, operated by a for
tioned on a flat car at or



TWO VIEWS OF THE OPEQUON CREEK BRIDGE DURING RECONSTRUCTION

new span was clear of the flat cars the latter were drawn from under it and the track and I-beam stringers of the old bridge were removed. Then ropes were made fast to the ends of the floor beams, run over single blocks attached to the tops of the old trusses and thence back to the drums of the hoisting engine. While these lines were held, the hanger bolts supporting the floor beams were cut off by means of oxy-acetylene torches. The beams were then lowered to the ground. After all of the beams had been removed in this way the new girders were lowered into place and the track restored to traffic.

With the new bridge in service the top lateral system was cut apart by the torches and then each old truss was tipped over into the stream by setting a jack on the track side of the end post and jacking them until they were overbalanced and fell about 34 ft. into the bed of the stream, which contained only a small amount of shallow water. Torches were used to cut the old ironwork into suitable pieces to be picked up by a small derrick so that it could be readily loaded onto cars for shipment.

This same scheme of dismantling old spans has been used for other structures in the same vicinity, where it has been found desirable in some instances to prepare a wooden cribwork to receive the old ironwork when it falls over. We are indebted to S. C. Tanner, master carpenter, Baltimore & Ohio, Baltimore, Md., for the photographs and information concerning these interesting old structures.

Renewal of Rail on the Norfolk & Western

By W. P. Wiltsee

Principal Assistant Engineer, Norfolk & Western, Norfolk, Va.

EARLY IN THE SPRING of each year the roadmasters and assistant superintendents make an inspection of the rail on their divisions to determine the amount which will be needed for renewals the following year. By the use of rail gages to determine the amount of wear, an estimate can be made as to how much longer the rails will last in the track. These recommendations are transmitted to the assistant general manager, who, accompanied by the writer, examines this rail on the ground, measuring the wear. From this inspection a statement is prepared showing the rail actually required for the following year. It is then purchased and distributed to the different divisions, according to this list.

The writer has made a study of the proper limits of wear of rails to be allowed, which has resulted in the preparation of plans which indicates the limit of wear for 100-lb. and 85-lb. rails, which are the standard sections in main tracks. The rails are tested with the rail-wear gage shown in the drawing. These limits of wear approximately fix the percentage of head wear as follows:

Per cent of head wear: Tangents, 100-lb. rail, 27 per cent; 85-lb. rail, 23 per cent. Low rail, 100-lb. rail, 23 per cent; 85-lb. rail, 19 per cent. High rail, 100-lb. rail, 28 per cent; 85-lb. rail, 25 per cent.

Amount of tread wear: Tangents, 100-lb. rail, $\frac{7}{16}$ in.; 85-lb. rail, $\frac{3}{8}$ in. Low rail, 100-lb. rail, $\frac{3}{8}$ in.; 85-lb. rail, $\frac{1}{4}$ in.

Amount of flange wear: High rail, 100-lb. rail, $\frac{3}{4}$ in. when tread wear is $\frac{1}{8}$ in., or $\frac{5}{8}$ in. when tread wear is $\frac{1}{4}$ in.

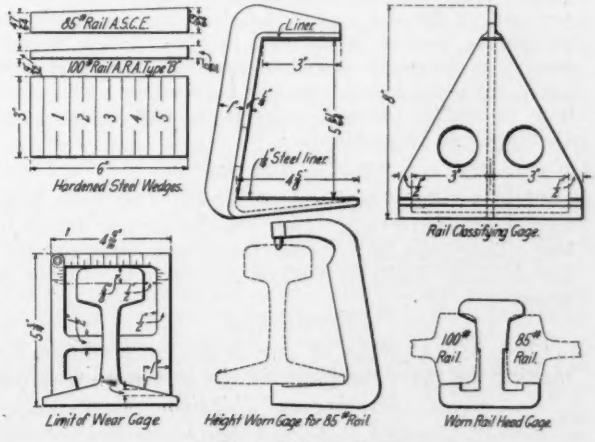
Amount of flange wear: High rail, 85-lb. rail, $\frac{5}{8}$ in. when tread wear is $\frac{1}{8}$ in., or $\frac{1}{2}$ in. when tread wear is $\frac{3}{16}$ in.

The flange wear is measured at a point $\frac{5}{8}$ in. below the top of the full height of new rail.

Rail on tangent and on the low side on curves generally has to be removed on account of rough spots, flow of metal, battered ends, etc., before it has reached this limit. The high rail on curves, however, can generally be run to the limit shown, as it is generally worn out in this manner rather than by rough surface. This limit has been fixed tentatively in an effort to secure uniformity of wear before removal. Some few rails of a curve may occasionally exceed this limit, but it is the general practice to remove rails by the time they are worn, as shown on this plan.

Before rail laying is begun in the spring, the locations listed the year previous are gone over by the roadmasters and assistant superintendents, and in case the wear of the rail has not been as great as expected, the relaying of the rail is deferred until such time as the rail has worn to the limits desired. Rails which are subject to heavy curve wear frequently last less than a year; in these sections the roadmaster keeps a supply of rails on hand for renewing curves as soon as they have reached the limits. Rails showing defects or signs of failure are naturally removed as soon as discovered. Rails with battered ends, rough spots, etc., are moved as soon as these defects become bad enough, in the opinion of those making the inspection, to cause their removal.

The annual inspection, which is made on motor car and by careful measuring the rails in question, with



A Rail Wear Gage

gages, has resulted in a more economical distribution and saving of rail, as the division officers are generally very liberal in their recommendations.

Classification of Relayer Rail.

We also have a classification for relayer rail, established January 1, 1917, as follows:

Main Track Relaying Rail.

Class 1: Second-hand rails suitable for renewal of similar rail in main track or branch lines. They shall be in lengths from 30 ft. to 33 ft. Ten per cent of short lengths varying by one foot will be accepted. The minimum length of short rails will be 25 ft. They must be free from all physical defects and shall pass the railway

company's specification for steel rail in all respects, except wear. They shall not show any flow of metal. The surface of rails of this class must be fairly smooth and not have flat spots or wheel burns. They may be worn so that the head is not more than ¼ in. smaller in width and ⅛ in. smaller in thickness than the original section. Rail must be sawed at the ends, not cut with a chisel, and have standard drilling. Rails of this class may be further classified as follows:

Class 1-A: No side wear; top wear not to exceed 1/32 in.
1-B: Side wear not to exceed ¼ in.; top wear not to exceed 1/32 in.
1-C: No side wear; top wear not to exceed 1/16 in.
1-D: Side wear not to exceed ¼ in.; top wear not to exceed 1/16 in.
1-E: No side wear; top wear not to exceed 3/32 in.
1-F: Side wear not to exceed ¼ in.; top wear not to exceed 3/32 in.
1-G: No side wear; top wear not to exceed ⅛ in.
1-H: Side wear not to exceed ¼ in.; top wear not to exceed ⅛ in.

Resawing Rails.

Class 2: All rails with battered or otherwise defective ends, which, if resawed, would meet the Class 1 requirements, will be accepted as resawing rails. These rails, when resawed, will be classed as "Main Track Relaying Rails."

Side Track Relaying Rail.

Class 3: All second-hand rails suitable for side tracks will be included in this class. They must not be less than 15 ft. long. Curve-worn rails will be accepted if the wear does not exceed 25 per cent of the width of head. They shall not be worn in height to exceed 25 per cent of the depth of the head. Rails too badly line or surface bent to be included in Class 1, but straight enough to be easily spiked to line and gage, and rails pitted or wheel-burnt, but still serviceable; rails with flow of metal, but still serviceable, will be accepted. Drilling must be standard.

Rolling Mill Rail.

Class 4: Rails of standard section, free from frog, switch and guard rails. They shall be not less than 6 ft. long. They must be free from pipes, split heads and similar defects. Badly twisted or curved rails will not be accepted.

Scrap Rail.

Class 5: All rails of any length or condition not meeting the above specifications will be classed as Scrap.

Marking and Shipping.

Rails of Classes 1, 2, 3 and 4 shall be marked by painting its class number and letter in white on the web of the rail about 3 ft. from each end. No two classifications of rails shall be loaded on the same car.

Rails removed from main line track in straight renewals frequently contain enough Class 1 rails to patch some of the curves needing renewals on the same roadmaster's district. If this occurs, these main track relaying rails are used in patching these curves. Rails which have not been worn to exceed the limits for main line relaying rail, but have battered ends (Class 2), are shipped into the rail mill, where they are cold-sawed, 10 in. being cut from the end, which makes the last bolt holes become the first bolt hole of the resawed rail, according to our rail drilling. These resawed rails are classified by means of the gages shown in the drawing. All rails which have been removed from track and which do not meet the Class 1 or Class 2 requirements, are classed either as No. 3, 4 or 5 rail. Class 3 or side track rail is stored at terminals by the division from which it is removed, unless called for shipment to some other division. Rolling mill rail is selected from the scrap rail according to the purchaser's requirement, and only when the purchasing agent has a sale for such rail, otherwise this rail goes into the scrap rail class. Scrap rail is shipped to the storekeeper, where it is either sold or otherwise disposed of at the shops.

A COMBINED SLEEPING AND LOUNGING BUILDING

By J. E. TIEDT

Supervisor of Water Tests, Rock Island Lines, El Reno, Okla

ENVIRONMENT has its influence on the physical output of the laborer. If you can give the individual good housing, good sleeping quarters and good meals, and instill, if possible, a home spirit, you have laid the foundation for a better, more fit unit, whether he be a section, shop, or bridge laborer. The curse of section labor is the roving spirit. This is practically true of every nationality that works upon our railroads. This problem cannot always be met by increasing pay or giving bonuses, because most roads must first take the question of increased pay up with various officers before anything can be done. This generally takes from a week to ten days and by that time a gang of men which has cost the road a considerable amount to get together, organize, and shape into a co-operative unit or force is scattered and gone. This has happened at competitive points where the difference in pay did not amount to over 10 cents a day. Sometimes gangs of men are broken up because of other reasons, which, if investigated, will be found to be due to living conditions..

As winter arrives and it is necessary to maintain a sufficient force to carry on the maintenance work, especially at terminals, and as it is absolutely necessary that this force remain intact, a workman's club room has been suggested as one solution of the labor problem. The building, of course, will be of a size to meet the requirement at the point where it would be deemed necessary.

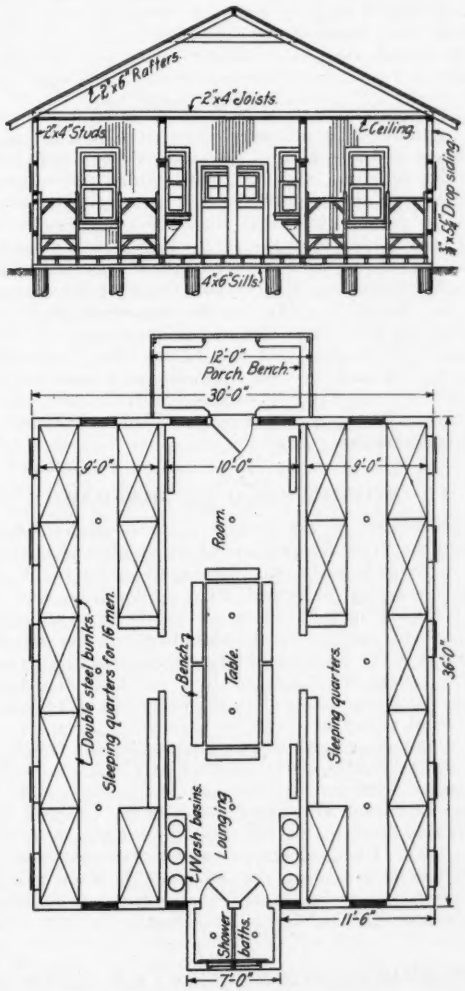
As installed on one road, the building consists of three rooms, two of which are sleeping compartments with a center room, which is called the lounging room. On the outside wall of the sleeping quarters a set of five double steel bunks are set end to end. Two double bunks are also set to the left of the room near the inside partition and one in the opposite right hand corner, as shown in the drawing. The outside bunks have small sliding windows, preferably 24 in. by 24 in. in size, with glass panes near the center of the bunks, which may be opened according to each individual's needs. The windows on each end furnish sufficient ventilation for the inside bunks. A space is left between the door and the single double bunk for a bench and hooks on which to hang up clothes. A doorway is cut into this room without a door. This room has accommodations for 16 men, and as there are two of these rooms in the building, it will furnish quarters for 32 men.

On the front of the building a porch about 6 ft. by 12 ft. is added, with bench seats around the sides. The heating is by steam, requiring about 4 radiators. No heat is provided in the sleeping quarters.

The outside dimensions of this building measure 30 ft. by 36 ft. and it is about 18 ft. high. It is of wooden construction with a foundation of pile butts set about

2 ft. 6 in. in the ground and 6 ft. apart. The sills are of 4 in. by 6 in. material with 2 in. by by 6 in. joists on 24-in. centers. The floor is of 1 in. by 6 in. boards. The studding is 2 in. by 4 in., covered with ¾ in. by 5¼ in. drop siding. The roof is of 1 in. by 6 in. boards, covered with prepared roofing. The building is lighted by electricity, there being ten drop lights.

This type of building has been tried out on a southwestern railroad and has proven decidedly successful. The present structure houses 20 men, of whom one is appointed "housekeeper," or, as he styles himself, "manager." The reading material is that which is left on passenger cars or taken from library or observation cars after it has been superseded by more literature.



Plan and Section of the House

It was thought at the time this plan was suggested that probably gambling or disorderly conduct might be prevalent among such a large body of men, but this is not the case. The first men employed were good, clean fellows and established a model for cleanliness and morality which has since been lived up to. At this point section labor is at a premium, demanding from 22 to 25 cents an hour. This company pays considerably less, and will have the reliable 20 men on hand as long as necessary. The supervisor of track has stated that without this building he believed that he would have to employ 200 men to keep a gang of 10 men on the tracks.

THE MATERIAL MARKET

THE MATERIAL MARKET, so far as railroads are concerned, is dull, because the railroads are withholding purchases awaiting action on the part of Director McAdoo's administration with regard to railroad programs for maintenance and construction. Another factor of uncertainty effecting the iron and steel market at the present time is the prospect of a readjustment of the fixed prices pursuant of a request by the manufacturers for some advances and equalizations to compensate for increased costs of manufacture. These changes are still pending.

With the announcement that the Government will make rail purchases along with those of cars and locomotives, railway officers are less concerned with the market conditions, for having determined the minimum requirements for rails the Government administration will unquestionably make whatever arrangements are necessary to insure deliveries. The prices of standard rails are now clearly established on a higher plane and are quoted at $55 per gross ton for Bessemer rails and $57 for open hearth rails.

Nothing can be said of track fastenings at the present time other than to quote the established prices. Standard track bolts are quoted at $4.90 per 100 lb., track spikes at $3.90, steel angle splice bars at $3.25 and rolled steel tie plates at $3.25. For particulars as to specifications and premiums for special requirements provided in connection with these fixed prices see the discussion of the material market in the March issue, page 112.

In structural steel the railroads have been more active. The New York Central, the Pennsylvania Railroad, the Chicago, Burlington & Quincy, the Lake Superior & Ispheming and the Missouri Pacific awarded contracts aggregating some 3,400 tons during the month of March. This total, however, is so small as compared with the entire structural steel business done in this country as to be no index of the general situation. Contracts taken by the bridge shops during January and February aggregated 95,400 tons and 99,900 tons respectively as compared to 205,200 tons in December.

The lumber situation has been improving. The mills are gradually catching up with the war orders. By the first of March the mills had delivered 240,000,000 ft. b. m. out of the total of 365,000,000 ft. b. m. required by the Government for its shipbuilding program. When these totals are compared with the 750,000,000 ft. b. m. furnished by the lumber mills during the first nine months of the war it is evident that they ought to have no trouble in taking care of current requirements. Some improvement is also noted as regards the restriction on the use of large sized timbers for other than Government purposes. The embargo on sizes 12 in. by 12 in. or larger placed on Southern pine has been modified to some extent so that the current difficulty in obtaining timbers for use in railway trestles should be overcome, at least in part. Small sized timbers are to be had in quantity, except for such difficulty as may be encountered because of a car shortage.

According to orders issued by Director-General McAdoo in connection with the organization of the purchasing section of the Division of Finances and Purchases of the Railroad Administration, all ties and lumber which can be obtained along the lines of the respective roads will be negotiated for and purchased through the purchasing department of each road under the supervision of the regional purchasing committees. Cross ties needed by various roads which cannot be obtained on their own lines will be purchased through the Washington office.

GENERAL NEWS DEPARTMENT

The Boston & Albany has formed a permanent organization of officers and employees to gather and record information concerning employees who are now in the military or naval service, and to take charge of the sending of gifts to the men.

The American Wood Preservers' Association has selected the Hotel Statler, St. Louis, Mo., as the headquarters for its next annual convention, which will be held on January 28 to 30, 1919. This action was taken at a meeting of the Executive committee held in Chicago on March 19.

The Thirty-fifth Engineers, formerly stationed at Camp Grant, Rockford, Ill., is now in service in France, according to word received from Capt. William R. Pearson of Company C of this regiment. Capt. Pearson was formerly assistant valuation engineer of the Nashville, Chattanooga & St. Louis.

The Colorado, Kansas & Oklahoma, a 50-mile Kansas railroad, which has run no trains for a long time, is to be dismantled. The contract for dismantling has been let to W. F. Bronson of Franklinville, N. Y. The line extends from Scott City, on the Missouri Pacific, north to Winona, on the Union Pacific.

Senator Kellogg of Minnesota has introduced a bill in Congress to include members of the Russian Railway Service Corps, consisting of about 350 railroad officers and men sent from this country to Russia last year to assist in organizing the Russian railway system, within the terms of the war insurance provided for the United States army. The Russian Railway Service Corps is not a part of the regular army, but was specially organized and was financed by the Russian government.

An increase in freight rates of 15 per cent to railroads in Official Classification Territory was allowed on March 15 by the Interstate Commerce Commission. This is supplemental to the increase in rates granted by the Commission on June 27, 1917; that is, in the earlier decision an increase of 15 per cent was allowed on only a part of the items on which the railroads asked increases, while the new decision allows them increases on nearly all the remaining items. In general the increases are 15 per cent, but the rate on anthracite coal was advanced 15 cents per ton, while those on lumber and forest products and cement were increased 1 cent per 100 lb.

The Railroad Control Bill which was passed by the Senate on March 13 was passed by the House on March 14 by a vote of 303 to 26 and has since been signed by the President. The director general is now authorized to proceed with the negotiations with the railroads regarding their compensation and with plans for expenditures for equipment and improvements as well as for financing the roads. A plan of accounting will be devised by Director Prouty of the division of public service and accounting. Where individual roads are unable to finance them improvements may be paid for in part out of the revolving fund, consisting of the $500,000,000 appropriation and the surplus earnings of any road above the guarantee.

The Southern Pacific, Pacific System, has announced the results of the last annual track inspection. The Coast division, of which T. Ahern is superintendent, received the highest number of perfect marks; the San Jose district, with M. Lahey as roadmaster, was declared the best roadmaster's district, and Section 11 of the San Jose district, of which C. C. Frederick is foreman, the best section. In accordance with established practice, both Mr. Lahey and Mr. Frederick received gold medals. Silver medals were awarded to 48 section foremen, 54 pumpers at pump-houses, 10 pumpers at fuel oil stations, 13 operators at power plants and 125 station agents and station masters for special merit in the maintenance of property in their charge.

The Pennsylvania Railroad has extended its "shipping day" plan for accepting and forwarding less-than-carload freight over all of its 25 divisions east of Pittsburgh and Erie. This plan was first put into effect on this road at Philadelphia on September 4, 1917, and was extended first to the larger cities on its line. Reports indicate that a total of 654 cars are being saved daily in the transportation of l. c. l. freight on these lines through the operation of this plan. In addition 25 distributing local freight trains per day have been discontinued altogether by substituting tri-weekly or semi-weekly "pickup" service on light traffic lines.

An unusual train accident occurred March 15 when the derailment and wrecking of steel sleeping cars was caused by a boulder weighing about 300 tons, which fell from a ledge at the side of the roadway just at the moment when these cars were passing, and after the engine and first three cars of the train had cleared the spot. This accident happened to westbound express train No. 19 of the Pennsylvania Railroad near Elizazbethtown, Pa., 17 miles east of Harrisburg, at 1 a. m. on March 15. The boulder measured 24 ft. long, 12 ft. wide and 8 ft. thick and it fell from near the top of a cut about 70 ft. deep. It first struck the third car in the train and this and the two following cars were knocked off the rails and wrecked. The rock had to be blasted to clear the track. Two passengers were killed and 24 passengers and 2 trainmen were injured.

MOVING FOOD TO SEABOARD

Special efforts are being made by the Railway Administration and the Food Administration to co-operate on the movement of food to seaboard. Herbert Hoover, food administrator, has agreed to furnish Director McAdoo with a statement showing what supplies are ready to move and what ports are to receive them. Another measure to expedite movement is the dispatching of solid special trains from Chicago and East St. Louis to New York, Philadelphia and Boston, for trans-shipment to the allies. In accordance with the general policy of curtailing passenger service to release engines and crews and reduce congestion for freight movement, the Director General authorized a reduction in passenger service between Chicago and St. Louis, which became effective on March 17. The four roads, the Chicago & Alton, the Illinois Central, the Wabash and Chicago & Eastern Illinois, had 15 trains between those cities and now operate only 9, but by arranging the schedules on a non-competitive basis, with the trains more evenly distributed throughout the 24 hours, no hardship has resulted.

STANDARDIZATION OF RAILWAY SUPPLIES

That steps would be taken to carry on some measure of standardization of railway equipment and supplies, became apparent very early in the course of the government control. Various committee have been appointed to investigate the possibilities of standardization and important progress has been made. Work is now in progress on standard box, gondola and hopper cars of wood and steel or a combination of the two. Similar work is being done with reference to locomotives. As the Director General's organization will purchase rails, it is expected that rails will also be standardized, but thus far nothing has been reported as regards track fastenings.

At first, the indications were that the standardization would be of a most drastic character, resulting in the elimination of nearly all patented devices. However, as the plans assume more definite form it appears that this is not the case. On February 25 George A. Post, president of the Railway Business Association, addressed a letter to Director McAdoo, calling attention to the large number of business interests

whose life would be jeopardized and to the throttling of any incentive for improvements that would follow a strict application of the proposed policy. In an interview which Mr. Post had with Mr. McAdoo, the latter stated that standardization would be carried out only as it would result in greater economy and celerity of production, and that he was opposed to any measure that would discourage new developments or improvements.

MORE RAILWAY MEN FOR THE ARMY

Col. W. J. Wilgus, formerly vice-president of the New York Central, who has been serving on the military railroads in France, recently returned to this country to co-operate with S. M. Felton, director general of military railways, in securing the enlistment of railway men for service as officers for additional railway regiments for overseas service. From the engineering departments the men desired are officers and ex-officers, who are or have been engineers maintenance of way, roadmasters and track supervisors, provided they are not over 45 years of age. In communicating with Mr. Felton at his office at 734 Fifteenth street, N. W., Washington, D. C., they should give their railroad experience in detail and their references.

Providing the qualifications are satisfactory, commissions will be given for the various ranks as follows: Engineers of maintenance of way, as captains; Roadmasters, as first lieutenants; Track supervisors, as second lieutenants.

Hugh McG. Taylor of San Antonio, who has been engaged in construction work in Cuba, has been given the rank of major. Paul M. LaBach, assistant engineer of the Rock Island Lines, has been made mechanical and water supply engineer with the rank of major. The following have been given the rank of first lieutenant and will serve as division engineers: T. P. Kennedy, R. F. Scott, Jr., M. W. Rust (Virginian), C. B. Harbeson, W. B. Maurer, A. W. Worthington (formerly with the Pennsylvania Lines and now with the Goodrich Rubber Co.), C. H. Jones (Erie). A. H. Scull has been commissioned second lieutenant and will serve as assistant division engineer. The following have been commissioned majors and will serve as deputy engineers of construction: E. W. Clark, N. F. Brown, P. L. Stalker and E. J. Langford. The following have been commissioned captains and will serve as assistant engineers of construction: R. S. Harden, F. E. Craft, J. L. Vogdes, T. B. Watson, E. B. Palmer, C. S. Platt, R. T. Frazier, Jr., and D. P. Beach.

ZONE SYSTEM OF COAL DISTRIBUTION

The United States Fuel Administration, in co-operation with the Director General of Railroads, has announced a zone system to govern the distribution of bituminous coal during the coal year beginning April 1, 1918.. The general effect of the system is to restrict eastern coal to eastern markets and fill the vacancy in the central and western states with coal produced in those states. Heretofore coal has been distributed practically without regard to distance between the mine and the consumer. Under the zone system coal will be distributed to consuming territory under restrictions that will avoid, as far as possible, waste of transportation facilities, but nevertheless consistent with the maintenance of the greater possible production and a proper supply to all coal users. Every effort has been made to preserve long established trade relations.

As an indication of the saving in transportation, the system will provide for the possible retention of approximately 5,000,000 tons of coal in the eastern states which heretofore has gone west. It will, for instance, eliminate the movement of more than 2,000,000 tons of Pocahontas coal to Chicago and western points over a haul of about 600 miles. Under the system Chicago must obtain this tonnage of coal from mines in southern Illinois with an average haul of 312 miles. Allowing for the differences in quality in the two coals, it is estimated that there will be thus saved 11,400,000 car miles or 285,000 car days. This will permit 14 additional round trips of 20 days each from West Virginia mines to zone destinations, permitting an additional production of at least 700,000 tons of Pocahontas coal.

The above is only one of the instances of transportation saving to be effected by the system. The bituminous coal, the movement of which is regulated by the zone system, is about 300,000,000 tons or 60 per cent of the total production. Based on this production, there will be saved on the round trip from and to the mines about 160,000,000 car miles. This will permit the same cars to make almost 300,000 additional trips from the mines, equivalent to an increase of 5 per cent in production. The total increase in production in 1917 over 1916 from all efforts was about 8 per cent.

Under regulation of the fuel administrator, coal of particular quality or characteristics for a special purpose such as by-product, gas, blacksmith and metallurgical coal will be permitted to move by permit beyond the limits imposed by the zone system. The zone system affects all bituminous coal except:

Coal for railroad fuel for which special arrangements will be made by the Fuel Administrator and the Director General of the Railroads; coal for movement on inland waterways which is in no way restricted by the system, and coal delivered to Canada which is subject to regulations of the Fuel Administrator.

ACTIVITIES OF THE RAILROAD ADMINISTRATION

The organization of the Director General of Railroads is gradually being extended and, with the improvement of weather conditions and the traffic situation, it has been possible to direct attention from emergency matters to the perfecting of arrangements for actual Government control.

Order No. 8 issued by the Director was designed to correct possible misunderstandings of order No. 1. The new order makes it plain that employees will be expected to work reasonable overtime in case emergencies demand, and that all acts and orders promoting the safety of employees and passengers will continue in force, although since the railroads are now in the possession of the Government it becomes futile to impose penalties except as applied to individuals. It also calls attention to the fact that wages and hours are being considered by a commission, and states that all questions concerning these points must await action of the commission. The purchasing organization has been perfected under the direction of John Skelton Williams, director of finances and purchases. There is a central advisory purchasing committee of three, headed by Henry B. Spencer, vice-president, Southern Railway, in charge of purchases. The committee will have general supervision of railway purchasing and will purchase direct all locomotives, cars and rails. There are also three regional committees in touch with the regional directors at New York, Chicago and Atlanta which will have supervision of the purchases made by the individual roads. In New England there is a special committee under the direction of the Washington office for purchasing fuel for that territory.

A recent development in connection with the organization of the Director General's staff is that all members thereof have severed their connections with the railroads from which they were recruited. Hereafter their salaries will be paid by the Government.

One of the latest circulars issued from the Director's office provides that the expenses of the financial or corporate offices of the railroads are not to be charged to operating expenses after April 1. This refers to the salaries of chairmen of boards of directors, executive committees, stock transfer clerks, etc. On February 23 Mr. McAdoo asked the roads to furnish detailed information concerning such expenses and this new order is the result.

In connection with rail requirements for this year, a circular has been addressed to the presidents of all Class I carriers asking them to send information to the Interstate Commerce Commission showing the number of gross tons of new rail placed in track during the calendar year 1917, the estimated amount required for 1918, separately for maintenance and construction, the minimum amount required to maintain track in safe condition during the year, the tonnage contracted for delivery, including that due on previous contracts or carried over on contracts for the previous year, and the tonnage of rail on hand on January 1.

PERSONAL MENTION

GENERAL

C. C. Higgins, a consulting engineer associated with **J. W. Kendrick,** Chicago, has been appointed assistant to the vice-president of the St. Louis-San Francisco, with headquarters at St. Louis, Mo., effective March 15.

W. L. Fox, supervisor on the Western & Atlantic division of the Nashville, Chattanooga & St. Louis, has been appointed trainmaster on the Tennessee & Coosa branch, succeeding **J. W. Tucker,** who has been promoted.

Gordon Grant, formerly chief engineer of the National Transcontinental Railway of Canada, has been appointed adviser to the Canadian Minister of Railways, a new office created by the Dominion Government.

E. E. Adams, consulting engineer of the Union Pacific System, has been appointed an assistant to **R. S. Lovett,** director of the division of capital expenditures of the United States Railroad Administration at Washington.

M. C. Blanchard, district engineer of the Atchison, Topeka & Santa Fe at Topeka, Kan., has been promoted to division superintendent with headquarters at Marceline, Mo., succeeding **R. H. Allison,** who has been transferred to the Illinois division, with headquarters at Chillicothe, Ill.

Henry Douglas Pollard, who has been appointed assistant general manager of the Central of Georgia, with headquarters at Savannah, Ga., is an engineer. He was born in October, 1872, at Aylett, Va., and was educated in the public schools and at Aberdeen Academy; he also took short courses at the University of Virginia, and at Drexel Institute, Philadelphia, Pa. In 1891 he began railway work as a rodman on construction work with the Baltimore & Ohio. In 1893 he was appointed assistant resident engineer of construction at Wellsville, Ohio, on the Ohio Southern, now a part of the Detroit, Toledo & Ironton. From 1894 to 1898 he was assistant engineer of maintenance of way on the Philadelphia division of the Baltimore & Ohio; the following year he served as transitman on survey and location work on the Central of Georgia. In 1900 he was appointed resident engineer of construction, and subsequently served consecutively as supervisor of track, trainmaster, roadmaster, and from June, 1905 to 1910, as superintendent of the same road at Macon, Ga. He was appointed assistant superintendent of the Sorocabana Railway, at San Paulo, Brazil, in 1911, and later was inspector general of the Campania Auxelliaire, at Santa Maria and Porto Alegre, Brazil. In 1913 he returned to the service of the Central of Georgia as valuation engineer and two years later was elected president of the Wrightsville & Tennille, with headquarters at Tennille, Ga., which position he held until his recent appointment as assistant general manager of the Central of Georgia, as above noted.

HENRY DOUGLAS POLLARD

Decatur Axtell, who has resigned as vice-president of the Chesapeake & Ohio, the Hocking Valley and Chesapeake & Ohio of Indiana, with headquarters at Richmond, Va., received his early training in the engineering department. He was born in Elyria, Ohio, and educated at the Illinois College. On March 16, 1864, he began railway work as a rodman with an engineering corps on the Pacific of Missouri and later served in various engineering capacities on the St. Louis & Iron Mountain, the Cairo & Fulton and the St. Louis, Iron Mountain & Southern, now a part of the Missouri Pacific, until July, 1880. On this date he was appointed general manager of the Richmond & Allegheny, and from that time on he held various operating and executive positions on the Chesapeake & Ohio and other roads until his resignation, noted above.

Andrew R. MacGowan, who has recently been appointed superintendent of the Pennsylvania division of the Delaware & Hudson, with headquarters at Carbondale, Pa., was born at Moncton, N. B., on January 16, 1883. He received a high school education and entered railway service with the Canadian Government Railways on January 19, 1899, serving consecutively as clerk, rodman and transitman until April, 1904, when he was made contractors' engineer on the Searsport branch of the Bangor & Aroostook. In January, 1906, he went with the Somerset Railway, now a part of the Maine Central, as resident engineer. In November of the same year he returned to the Canadian Government Railways as assistant engineer, remaining in that position until April, 1915, when he was made division engineer. He held this position until December of the same year, when he was appointed principal assistant engineer. In July, 1916, he was appointed superintendent, which position he held when appointed superintendent of the Delaware & Hudson, as noted above.

ENGINEERING

C. S. Henning has been appointed chief engineer of the New Mexico Central, with office at Santa Fe, N. M.

J. P. Nelson, in addition to his duties as valuation engineer of the Chesapeake & Ohio, has been appointed real estate agent, with headquarters at Richmond, Va.

C. H. Davis has been appointed acting resident engineer of the Toronto Terminals, Canadian Pacific, with headquarters at Toronto, Ont., succeeding **H. R. Silcox,** who has been assigned to other duties.

H. R. Manby, superintendent and engineer maintenance of way of the Tennessee Central, with office at Nashville, Tenn., has been appointed chief engineer and the position of engineer maintenance of way has been abolished.

W. C. Pembroke, assistant engineer of the Coal & Coke Railway, with headquarters at Gassaway, W. Va., has been appointed engineer maintenance of way, with the same headquarters, succeeding **A. C. Hawkins,** who has resigned.

P. D. Miller, assistant division engineer of the Pennsylvania Railroad, Western Lines, with headquarters at Cambridge, Ohio, has been transferred to Toledo, succeeding **Howard O'Brien,** who has resigned, effective February 15.

G. B. Herington has been assigned to the Tucson division of the Southern Pacific as supervising engineer, with headquarters at Tucson, Ariz., and will have general charge of all matters pertaining to maintenance of way and structures.

W. A. Guild, division engineer of the Atchison, Topeka & Santa Fe, with headquarters at Chillicothe, Ill., has been promoted to district engineer, with headquarters at Topeka, Kan., succeeding **M. C. Blanchard,** who has been promoted, as noted elsewhere.

A. Leckie, division engineer of the Kansas City Southern, with office at Kansas City, Mo., has been transferred to the Southern division, with headquarters at Texarkana, Texas, succeeding **R. H. Gains,** who has resigned to go with another company. **W. J. Lank** has been appointed division engineer to succeed Mr. Leckie.

Arthur McGuire, chief engineer of the Los Angeles & Salt Lake, has assumed the duties of the engineer maintenance of way, this position having been abolished. **R. K. Brown,** who has been engineer maintenance of way, has been appointed division engineer at Salt Lake, succeeding **Frank Strong,** who has resigned to enter military service. These changes were made because of the cessation of construction

work and the approaching completion of the valuation work on this road.

Warren H. Eyer has been made engineer and roadmaster of the Bloomsburgh & Sullivan, with headquarters at Bloomsburgh, Pa. He was born at Bloomsburgh, Pa., on February 13, 1863, and graduated from the Gettysburg College in 1883. In the same year he entered railway service as a chainman and rodman with the Wilkes-Barre & Western. The next year he became instrument man on the East River tunnel between New York and Brooklyn, and a year later was made assistant engineer of preliminary surveys and construction on the Bloomsburgh & Sullivan. In 1887 he was levelman on the Baltimore & Drumpoint, and for the next two years was assistant to the resident engineer of the Louisville & Nashville. From 1889 to 1891 he was resident engineer of the South Dakota & North, with headquarters at Rapid City, S. D., and from the latter year until the time of his appointment, as noted above, he was engaged in municipal and general engineering work.

C. W. Richey, who was appointed assistant division engineer on the Pittsburgh division of the Pennsylvania Railroad, as previously noted, was born in Allegheny, now part of Pittsburgh, Pa., on June 27, 1872. He attended public schools in Allegheny until 1886, when he became a call boy at the outer depot yards of the Pennsylvania Lines, Southwest System. He held various clerical positions until 1889, when he left the service of the company. He was subsequently re-employed in 1890 by the same road in the office of the chief engineer as axeman, and later as chainman on a preliminary survey along Little Beaver creek, Ohio. He returned from this survey and entered Park Institute, Allegheny, and later Western University of Pennsylvania, now the University of Pittsburgh. He graduated in 1895, and after a brief experience as transitman for a mining engineer in Colorado, returned to Pittsburgh and obtained employment with the Keystone Bridge Works in the winter of 1895 as a structural draftsman. In February, 1900, he was appointed master carpenter on the West Pennsylvania division of the Pennsylvania Railroad. He was transferred in the same capacity to the Pittsburgh division on November 1, 1905, and promoted to assistant division engineer on the Pittsburgh division on February 1, 1918.

V. B. Wagner, whose appointment as chief engineer of the Cripple Creek & Colorado Springs, with office at Colorado Springs, Colo., was announced in these columns, was born at Virginia City, Nev., on April 23, 1879. He entered the service of the Denver, Boulder & North Western in October, 1897, as a rodman and chainman on the construction of 10 miles of narrow-gage track from Boulder, Colo., to Ward. He was employed by the Colorado & Southern from January, 1899, until 1901. He was instrument man on the construction of the Salmon river extension of the Oregon Short Line from March to June, 1901. From June to October, 1901, he was levelman on preliminary location from Durango, Colo., to Clifton, Ariz., on the Arizona & Colorado. In November, 1901, he was employed as an instrument man on the Colorado & Southern and in March, 1903, was promoted to chief draftsman in the office of the chief engineer. He was employed by the Nevada Northern as a draftsman from January to December, 1907, and was later promoted to resident engineer. From March to July, 1908, he was draftsman for a locating party on the Colorado & Southern; from July to October, 1908, he was draftsman in the chief engineer's office of the Denver & Rio Grande; from October, 1908, to February, 1909, he was engaged in the general practice of engineering at Ft. Collins, Colo.; and from March, 1909, to July, 1910, he was construction engineer for the street railway system at Greeley, Colo. He again returned to the Colorado & Southern in June, 1910, as resident engineer and was later promoted to office engineer at construction headquarters. On April 1, 1912, he was appointed chief engineer of the Colorado Midland, with headquarters at Colorado Springs, Colo., and in February, 1914, he was assigned additional duties as chairman of the valuation committee of the road.

V. B. Wagner

W. E. Brown, assistant division engineer of the Pittsburgh division of the Pennsylvania Railroad, with headquarters at Pittsburgh, Pa., whose promotion to division engineer of the Elmira division, with office at Elmira, N. Y., has already been noted in these columns, was born at Elma, N. Y., in September, 1878. He was educated in the public schools and at Ohio university, and began his railway work in November, 1897, as chainman and draftsman in the engineering department of the Western New York & Pennsylvania. In August and September, 1900, while on a furlough, he worked as a rodman on the middle division of the Erie canal at Syracuse, N. Y. He re-entered the service of the Pennsylvania on September 20, 1900, as a rodman at Buffalo, N. Y. Later he was promoted to transitman at Altoona, Pa. He subsequently served as assistant supervisor on the Conemaugh division, and on the Maryland division, then as supervisor at St. Marys, Pa., Hollidaysburg and Derry, and as assistant division engineer at Pittsburgh, as noted above.

W. E. Brown

TRACK

L. Cartier has been appointed roadmaster of the Grand Trunk Pacific, with headquarters at Biggar, Sask., succeeding **W. R. Whitby.**

James Hall Thomas, section foreman on the Erie, whose appointment as supervisor, with headquarters at Bradford, Pa., has been announced in these columns, was born at Swains, N. Y., on June 1, 1889, and received a common school education, entering railway service on April 14, 1909, with the Erie, as a timekeeper for an extra gang. In December, 1909, he was made a trackman, and served in turn as timekeeper, extra gang foreman on different gangs, section foreman, general foreman, and from November, 1915, to February, 1918, as foreman.

G. J. Bowe, who has been appointed supervisor of the New York Central, with headquarters at Oswego, N. Y., succeeding **J. W. Powers,** transferred to Rochester, started railway work as a section laborer on the New York Central and has been in continuous service with this road. After serving as section laborer he became in turn work train foreman, storekeeper in the office of the track supervisor at Syracuse, extra gang foreman, general foreman in the Utica yard, when the new yard was built, and assistant supervisor at Utica, from which position he was made supervisor, as noted above. During the past year he was engaged for a time on track work at Camp Merrett, N. J.

C. E. Gentner, extra gang foreman on the Buffalo, Rochester & Pittsburgh, has been promoted to roadmaster of the Erie division, with headquarters at Bradford, Pa., succeeding **G. S. Harden,** resigned. Mr. Gentner entered the service of

the Buffalo, Rochester & Pittsburgh in November, 1889, at the age of 17 years and has since been continuously in the employ of this company. His first work was with a fence gang, working out of Springville, N. Y. In April, 1891, he became a section laborer at the same point, being promoted to trackwalker in 1893. In April, 1899, he was promoted to section foreman at Bingham, Pa., and he subsequently served in this capacity at Limestone, N. Y., and Salamanca. In addition to his duties as section foreman at Salamanca he has served as extra gang foreman on the Buffalo and Erie divisions from three to four months each year.

John Reinehr, whose appointment as superintendent of the frog, switch and lamp shops of the Chicago, Milwaukee & St. Paul, with headquarters at Tomah, Wis., was announced in the January issue of the *Railway Maintenance Engineer,* entered the service of the Chicago, Milwaukee & St. Paul in 1886, at Watertown Junction, Wis., in the rail reclaiming plant and has been in the continuous employ of that road to the present time. He remained at the Watertown plant until 1891, when he was placed in charge of a newly-erected rail reclaiming plant of the St. Paul at Savanna, Ill. Mr. Reinehr continued in charge of the plant at Savanna until December, 1917, when he was appointed superintendent of the frog, switch and lamp shops at Tomah, as noted above. He succeeded **Ira G. Stutsman** at Tomah, who has resigned and is replaced at Savanna by **Elmer Swanson.**

JOHN REINEHR

BRIDGE

Arthur R. Eitzen, formerly office engineer in the bridge department of the Kansas City Terminal Railway, and more recently with the Kansas City Bridge Company, has been appointed bridge engineer of the Missouri, Kansas & Texas, with headquarters at Dallas, Texas.

PURCHASING

A. H. Young, tie and timber agent of the Seaboard Air Line, with office at Hamlet, N. C., has been appointed general storekeeper, with office at Portsmouth, Va., succeeding **D. D. Cain,** who has resigned to become associated with another company. **J. G. Calori** has been appointed tie and timber agent succeeding Mr. Young.

OBITUARY

Max J. Burgdorf, one of the construction engineers in the building of the Cripple Creek & Colorado Springs Railroad, and engineer for the company since the completion of the road, died February 12 at Colorado Springs, Colo.

A. W. Wright, a railway construction engineer, died at Los Angeles, Cal., on February 3. He had charge of much of the construction of the Union Pacific in the early sixties and later of the Northern Pacific. He was also connected in an engineering capacity with a number of cable railways.

W. S. Danes, retired engineer maintenance of way on the Peru division of the Wabash, with headquarters at Peru, Indiana, died in Chicago on February 22, 1918, at the age of 65. He was born at Belleville, Mich., July 7, 1853, and entered railway service with the Wabash in September, 1880, as general foreman in charge of bridges and buildings. He was later promoted to superintendent of bridges and buildings and still later was made engineer maintenance of way, from which position he resigned active railway service.

CONSTRUCTION NEWS

The Alabama Interurban has awarded a contract to A. T. Newell & Brothers, Birmingham, Ala., to build a double track main line between lock 17 on the Warrior river and Birmingham, Ala., and numerous spurs to reach ore, coal and timber lands.

The Arcade & Attica plans to build an engine house at Arcade, N. Y., which will be 60 ft. wide and 75 ft. long and of cement block construction.

The Delaware, Lackawanna & Western is planning to make improvements at Binghamton, N. Y., which will involve the handling of about 300,000 cu. yd. of earth fill and the relocation of tracks in the freight yards. Bids for the work will probably be asked for in the near future.

The Emory River Lumber Company's Road has made plans to build a 10-mile line from Lancing, Tenn., to timber lands in Morgan county to handle lumber and coal. Three steel bridges aggregating 200 ft. in length will be built in addition to six trestles.

The Erie has completed plans to build a steel bridge about 70 ft. long and 61 ft. wide with concrete floor over the tracks at Rochester, N. Y. The new bridge will connect Clarissa street with the bridge over the Genesee river.

The Florida East Coast is building a paint shop with company forces at St. Augustine, Fla., which will cost about $15,000. The structure will have a wood frame with a slate roof and will be one story high, 88 ft. wide and 100 ft. long.

The Indianapolis Union and other railways in the vicinity will complete their track elevation work at Indianapolis, Ind., with some modifications of the original plan, acting on instructions from Director General McAdoo. This decision is based on a report made by Commissioner Harlan of the Interstate Commerce Commission. Over $7,000,000 has already been spent and about $6,000,000 more will be required.

The Magdalen River Railroad has been granted an extension of time by the Quebec legislature in which to build its projected line along the Magdalen river valley to Little Falls, and has authorized the construction of a line from that point south and west, to connect with the Atlantic, Quebec & Western and the Canadian & Gulf Terminal at Gaspe, or at some other point on either of these roads; also to build wharves, docks and deep-water terminals at Gaspe.

The Morgantown & Wheeling plans to carry out improvements during 1918 to reduce grades to a maximum of 1.2 per cent and the curvature to a maximum of 16 deg. The work will also include relocating the main track between Randell and Cassville and building one steel bridge 110 ft. long and another 70 ft. long.

The Nashville, Chattanooga & St. Louis has awarded a contract to the Mason & Hanger Company of Lexington, Ky., and Richmond, Va., to build an extension 7½ miles long from its Lebanon branch near Hermitage, Tenn., to the site of a large powder plant being built by the government. A spur line will also be built to connect the powder plant with the Tennessee Central.

The Pennsylvania Railroad is making alterations and building an extension to its freight house at River street, Newark, N. J., at a cost of about $16,000.

The Southern plans to build a new station at Cordova, Ala. The building will be of frame construction and will replace a structure destroyed by fire.

The Western Maryland has awarded a contract to the Price Construction Company, Baltimore, Md., to erect a shop building at Hagerstown, Md. The building will be of brick construction with slag roof and will be 34 ft. wide and 80 ft. long. The cost of the work will approximate $10,000.

SUPPLY TRADE NEWS

PERSONAL

Robert M. Nelson, advertising manager of the Certain-teed Products Corporation, St. Louis, has been elected secretary and treasurer. He will continue his advertising duties.

L. H. Mummert of the Sanitary Bunk Company has moved his office from Indianapolis to the main office of the company, 408 West Fourth street, Cincinnati, Ohio.

H. J. Tierney, president of the Tierney Supply & Lumber Company, Chicago, has been appointed representative of the Grip Nut Company, Chicago, with office at 1742 Railway Exchange building, St. Louis, Mo.

Walter H. Allen, for several years in the track department of the Pennsylvania Steel Company, Steelton, Pa., and for the last two years with the Maxwell Motor Company, Detroit, has become associated with the Taylor-Wharton Iron and Steel Company, with headquarters at 30 Church street, New York,

G. W. Bichlmier, who formerly was connected with the supply departments of the Missouri Pacific and the Kansas City Southern, and was also secretary-treasurer of the W. L. Sullivan Machinery Company, has become associated with the Walter A. Zelnicker Supply Company, St.. Louis, Mo., in the machinery department.

Ernest Baxter, general storekeeper of the Wabash, with headquarters at St. Louis, Mo., has resigned to become manager of railroad sales for the Kansas City Bolt & Nut Company, with office at Kansas City, Mo., effective March 1. He was born at Delmer, Ont., on October 11, 1882, and entered railway service with the Michigan Central in March, 1903, as a messenger in the local freight office. In May, 1903, he went with the Algoma Central & Hudson Bay at Sault Ste. Marie, Ont., in a similar capacity. In October of the same year he was appointed secretary to the superintendent of the Grand Trunk at London, Ont., and in April, 1905, he entered the operating department of the Cincinnati, Hamilton & Dayton at Indianapolis, Ind., and still later that of the Missouri Pacific at St. Louis, Mo. In February, 1906, he was appointed secretary to the general manager of the St. Louis Southwestern at St. Louis, and in May, 1909, was promoted to chief clerk to the president. In June, 1914, he was appointed purchasing agent of the same railroad, which position he held two years, when he went with the Wabash as service inspector, with headquarters at St. Louis, Mo. On April 30, 1917, he was appointed general storekeeper of the Wabash, with headquarters at St. Louis, and it is from this position that he is resigning to go with the Kansas City Bolt & Nut Company, as noted above.

Ernest Baxter

J. L. Price, assistant to the chairman of the board of directors of the Chicago Pneumatic Tool Company, Chicago, was recently elected vice-president in charge of finances. He was also re-elected assistant to the chairman of the board of directors and in that capacity will continue to act as the representative of the chairman. He was born at Springfield, Ill., and entered the employ of a bank in that city after graduating from high school. He later became associated with Francis Beidler & Co., Chicago, and for some years was general manager of a mill in the lumber district controlled by them. He served in various executive and financial capacities with Armour & Co., and for about five years was president of the Stock Yards National Bank of Ft. Worth, Tex. Later he was associated with the Atlantic National Bank, of the city of New York.

W. D. Horton, circulation manager of the Simmons-Boardman Publishing Company, publishers of the *Railway Maintenance Engineer,* has resigned to accept a position as district railway sales manager of the Patton Paint Company, with headquarters at Milwaukee, Wis., effective March 1. Mr. Horton was born in Brooklyn, N. Y., December 3, 1880, and was educated in the public schools of that city. On June 1, 1908, he joined the staff of the Simmons-Boardman Publishing Company, and from 1908 to 1914 acted as traveling subscription representative, on April 1, 1914, being appointed circulation manager. Mr. Horton has had a wide selling experience, having spent several years, previous to 1908, selling various commodities such as stationary engines, boilers, wood-working and other machinery. In this work he traveled extensively throughout the United States, Canada, Mexico, Cuba, the West Indies, and in South and Central America. As circulation manager, he obtained a wide personal acquaintance among executive officers and department heads of nearly all the railways in the United States and Canada.

W. D. Horton

Karl J. Eklund has been appointed general manager of Mudge & Co., in charge of the engineering and manufacturing departments, with headquarters at Chicago. Mr. Eklund was born on July 8, 1884, and was educated in the public and high schools of Keene, New Hampshire. He started his railroad service as a blacksmith helper in the Boston & Maine shops, and from March, 1903, to April, 1906, served his apprenticeship as machinist on that railroad. During the next two years he was employed on various railroads as journeyman machinist, and in 1908 returned to the Boston & Maine as machinist and foreman in the Keene, N. H., shops. On March 1, 1910, he left the service of this road to accept a position with the Pilliod Company of New York and Swanton, Ohio, as Baker valve gear inspector, and on February 1, 1915, he was appointed assistant to the president of the Pilliod Company, with headquarters at New York. He occupied this position until April 1, 1917, when he was appointed assistant to the president of Mudge & Co., Chicago, which is the western representative of the Pilliod Company, and served in this capacity until his appointment as general manager on March 1, 1918. In this capacity he will continue to direct the service departments of the Pilliod

Karl J. Eklund

Company, and the Chambers Valve Company, both of whom are represented in the west by Mudge & Co. He will also have charge of the service department of Mudge & Co., in addition to the engineering and manufacturing departments.

W. I. Seigle, a member of the board of directors of the H. W. Johns-Manville Company, New York City, has been elected vice president at a recent meeting of the board. **William T. Klauss** was elected a director to succeed Mr. Seigle.

Edward U. Smith, chief draftsman with the Austin Company, at Philadelhpia, Pa., has been promoted to district engineer of the Philadelphia branch, with jurisdiction over the states of New Jersey, Delaware, Maryland and Eastern Pennsylvania.

R. S. Cooper, who for several years has been in charge of the New York office of the Independent Pneumatic Tool Company, Chicago, has been elected vice-president and general sales manager, with headquarters in the Thor building, Chicago. **R. T. Scott,** who has been in charge of the Pittsburgh office, succeeds Mr. Cooper at New York, and **H. F. Finney** succeeds Mr. Scott at Pittsburgh.

GENERAL

The Asbestos Protected Metal Company, Pittsburgh, announces the removal of its Boston office to the State Mutual building, with Wm. H. Cummings in charge.

The Permutit Company, manufacturers of water softening and water rectification apparatus, which has been located at 30 East Forty-second street, New York, for several years, announces its removal to 440 Fourth avenue, where the entire top floor will be occupied by its offices.

The Tar Carbolineum Wood Preserving Company, New York, which for over 40 years has sold Avenarius Carbolineum, has changed the name of its product to Protexol and under this trade name will continue to supply a wood preservative identical in every respect with the one sold for many years under the name of Avenarius Carbolineum.

The Trussed Concrete Steel Company, Youngstown, Ohio, announces a change in its name to the Truscon Steel Company. Aside from this simplification of the name, there has been no change in the company, its organization, or management in any way. The Trussed Concrete Steel Company, in its early days, devoted itself exclusively to reinforced concrete, introducing many new reinforcing products, such as the Kahn Bar, Floretyles, etc. For many years, however, the activities of this organization have expanded far beyond the concrete field so as to include a large variety of steel products. Prominent among these might be mentioned the steel windows, metal lath, pressed steel joists, all-steel buildings, inserts and other specialties.

For years the company has been generally known by the name "Truscon"—a simplified abbreviation of the longer name. For this reason "Truscon Steel Company" has been selected as the new name of the company.

P. & M. Patent Claims Sustained.—The United States Circuit Court of Appeals for the Seventh Circuit handed down a decision on March 9 denying the petition for rehearing filed some time ago by the Ajax Rail Anchor Company, Chicago, in the suit brought against it by the P. & M. Company, Chicago, for an infringement of the Kramer patent No. 1,014,155 by the Ajax rail anchor. The suit of the P. & M. Company versus the Ajax Rail Anchor Company has been in the courts since early in 1914. In the lower court the case went against the plaintiff, but no opinion was handed down. In the Court of Appeals the decision handed down in the October, 1916, term was unanimous in favor of the P. & M. Company and Judge Mack rendered an opinion which, taken in conjunction with the opinion of the court in the suit of the Track Specialties Company versus Barnett, which was handed down at the same time, is considered to have defined the art as entirely independent from that of rail joints, tie plates or other rail fastenings. In this decision the court stated that "The fundamental features of the Kramer patent are employed in the Ajax structure in order to secure the same objects. The latter not only responds literally to the Kramer claims, but it operates on the same general principles and is essentially similar in form so far as form is material to obtain the results sought by Kramer. Transposition of parts without change of operation or function is of no importance. That the Ajax, by decreasing very considerably the amount of metal required without in any way altering the method of operation or the objects to be attained, represents a valuable improvement over Kramer, does not save it from the charge of infringement inasmuch as, despite the changes in form thereby secured, the structure is built and embodies Kramer's conception and contribution to the art."

TRADE PUBLICATIONS

Motor Cars.—Murge & Company, Chicago, has issued an attractive 28-page booklet illustrating and describing the different types of motor cars made by this company. The booklet contains copies of advertisements which have appeared in technical papers recently, pointing out the advantages of this make of cars and the names of a number of railroads using Mudge cars.

New York Connecting Railroad.—The Lehigh Portland Cement Company, Allentown, Pa., has issued two pamphlets commemorating this monumental work. One of these is a folder showing some well-executed illustrations of the various structures composing this project, and the other is a brief account of the New York connecting railroad illustrated by maps.

Catalogue No. 110—George B. Carpenter & Co., Chicago, has issued a new edition of its well-known catalogue of general supplies and equipments for railroads, contractors' mills, etc. The catalogue covers all manner of construction equipment, such as carpenters' tools, pumping equipment, derricks, portable houses, etc. The new edition contains 1,085 pages, of which 37 pages in the back of the book are devoted to a complete index.

An Investigation of Pipe Corrosion.—This is the title of Bulletin No. 30, issued by the A. M. Byers Company, Pittsburgh, Pa. The investigation was prompted by local agitation on the part of property owners in Pittsburgh, due to the difficulty of maintaining hot water pipe lines. It involved an investigation of the condition of hot water pipes in 125 apartment buildings in the city of Pittsburgh, and the data is arranged to show a comparison of the life of wrought-iron and steel pipes.

Concrete Products.—The C. F. Massey Company, Chicago, has issued a 22-page pamphlet illustrating and describing the concrete products made by that company under the pre-cast system. These include piles, culvert pipes, hollow reinforced concrete poles and lighting standards, battery wells, portable concrete houses and reinforced concrete slabs for trestles. The illustrations show the outward appearance and construction details of the various items, illustrate the process of manufacture and show the assembled units in the finished structure. The keynote of the book is low maintenance costs through the use of concrete manufactured under factory conditions, where a uniformly high grade of workmanship is possible.

Women on Railroads.—Pauline Goldmark, representative of the Consumers' League and other organizations, appeared before the Railroad Wage Commission at Washington at a special session on February 28, to give testimony regarding the employment of women in railroad work. She said that women first were employed in any considerable number by the railroads about a year ago, at the instance of the Railroads' War Board, and that while they were at first employed for clerical and other light work, they have since been employed in increasing numbers for heavier work in freight yards, track repairs and shops. Some of this work, she said, involved too great a physical strain, as in cases where they are required to lift heavy weights.

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